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Determining Nebraska elementary students' understanding of agriculture concepts: as defined by Nebraska Agricultural Education Curriculum Framework and Content Standards

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Determining Nebraska elementary students' understanding of agriculture concepts: As defined by Nebraska Agricultural Education Curriculum Framework and Content Standards

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Signatures have been redacted for privacy

For Triple T Farms

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CHAPTER I: INTRODUCTION

Overview

A century ago, most Americans had ties to the land through their own lives and those of immediate kin. Now only one in fifty is engaged in farming, and little more than a fourth live in rural communities (Elder & Conger, 2000). Yet, the agricultural industry plays too large a role in every consumer's life to be ignored.

> Many people would be surprised to find that they rely on at least half-a-dozen agricultural products each morning, in the brief time between the buzz of their alarm clock and their daily drive to the office. When you think about it, you really cannot have an 'ag-less' day. (Hellerich, personal communication, July 29, 2003)

> Agriculture is a daily part of each of our lives, yet it is an aspect that is generally taken for granted. The consumer is faced with a maraud of choices in the grocery store, yet there are a lot of children who have no idea how their food gets to the grocery store. (McNeil, as quoted in Jansen, 2002, p. 1)

Agriculture, also identified as the food and fiber system, has a tremendous impact on the economy. In 1999, the United States exported $49.1 billion dollars worth of agricultural products around the globe (American Farm Bureau Federation, 2000). The economy of the state of Nebraska is heavily dependent on the success of agriculture. The accurate education of its citizens in relation to the components and development of Nebraska's agribusiness is recognized as a critical system (Nebraska State Board of Education, 1999).

Agriculture is the nation's largest employer, with more than 22 million people working in some phase—from growing food and fiber to selling it at the supermarket (American Farm Bureau Federation, 2000). In fact, one of every five jobs in private industry

within the United States is related to agriculture (National FFA Organization, (n.d.). However, recent United States Department of Agriculture projections predict a shortfall of qualified human resources to assume the employment needs of the agricultural industry (Nebraska State Board of Education, 1999).

Williams and White (1991) stated that a "basic knowledge of agriculture is especially important where it is the major industry in a state and the lack of agricultural knowledge and experience impedes economic development." Twenty-two percent of the Nebraska work force are employed in some phase of the production, distribution, and processing of agricultural products. This percentage is the highest for any state in the country (United States Department of Agriculture, National Ag Statistics Service, n.d.).

In contrast, the number of farm families in the state of Nebraska has been steadily decreasing. The trend throughout Nebraska is to fewer farms, with an increased number of acres per farm (United States Department of Agriculture – National Agricultural Statistics Service, 1999) (See Figure 1).

Nationwide, as more homes are built on prime farmland, a smaller number of farms are providing of the basic needs of many more people. In fact, less than 2% of the U.S. population is now engaged in production agriculture (University of Arizona, n.d.). Additionally, the National Research Council (1988) reports that the vast majority of the population in the United States is approaching a point in time that is fully two generations removed from any on-farm experience (National Research Council, 1988).

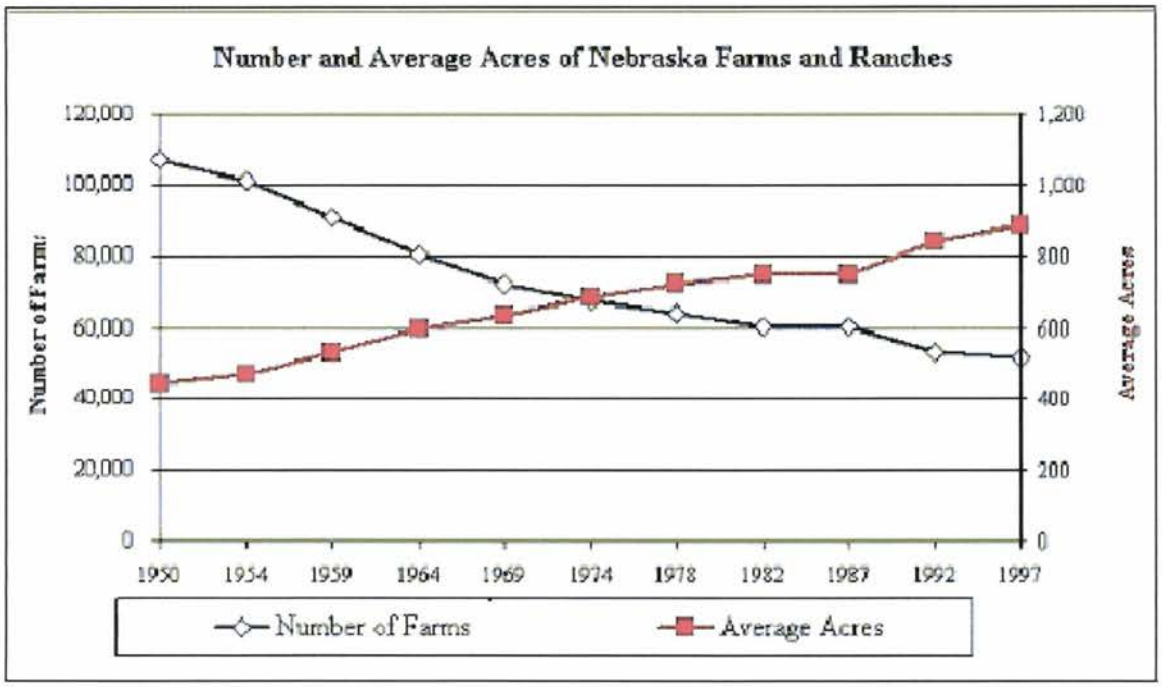

Figure 1. United States Department of Agriculture – National Agricultural Statistics Service (1999)

In the year 2000, the earth's population topped six billion. While each of those people depend on agriculture for their food, clothing, shelter, and a variety of other products, less than 4% of the population in the industrialized countries, and only 2% in the United States, are directly engaged in production agriculture. As the urban population increases and fewer people have direct involvement in production agriculture, consumers will increasingly take the world food supply for granted (Borlaug, n.d.).

Purpose of Study

In 1917, when federally supported high school agricultural education, then termed vocational agriculture, was created, approximately one-third of the United States population lived on farms. Currently that number is approximately 2% (National Research Council, 1988). Because the American public does not receive agricultural knowledge from everyday experiences, as they would have in the past, there is an increased need for education in agricultural issues (Meunier, Talbert, & Latour, 2002).

This research arose from a need to understand the current agricultural knowledge of elementary teachers and students, in an effort to provide effective agricultural literacy curriculum. This study assessed the perceptions of teachers and students' understandings of agriculture. Teachers and students were all purposely selected from Educational Service Unit (ESU) #2, in eastern Nebraska. The ESU #2 serves 20 schools within Burt, Cuming, Dodge, and Saunders counties (See Figure 2).

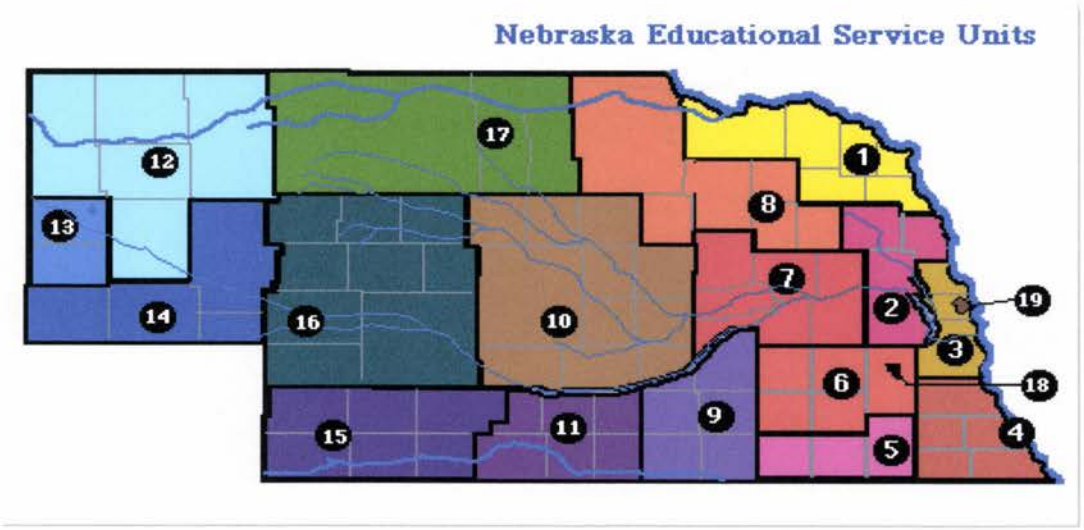

Figure 2. Map of Educational Service Units (ESU) in Nebraska.

Nebraska fourth-grade elementary students and teachers' understandings, in this study, were assessed based on the agricultural literacy concepts outlined in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999b) (See Appendix A).

The study also explored participants' backgrounds, experiences, and sources of agricultural literacy knowledge, such as a county or state fair, classroom instruction, and 4-H. Through this study of agricultural literacy understandings, elementary educators, agricultural literacy curriculum specialists, and extension educators will be better able to develop effective agricultural literacy curriculum for elementary students.

Research Objectives

Three objectives were specified for this study, as follows:

1) Explore teachers and students' backgrounds and experiences, relative to agricultural literacy knowledge.

2) Determine how Nebraska fourth-grade elementary students' understandings of agriculture, or agricultural literacy, compare to goal concepts outlined by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

3) Determine extent of integration of agricultural concepts into the academic curriculum.

Justification of the Study

Numerous groups have long emphasized the need for agricultural education. This position was given increased credibility, though, with the National Research Council's report (1988), which stated that

> Agriculture – broadly defined – is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursing vocational agriculture studies...The committee concluded that at least some instruction about agriculture should be offered to all students, regardless of their career goals or whether they are urban, suburban, or rural. (National Research Council, 1988, p. 8)

The National Research Council (1988) defined agricultural education as "education in agriculture" (p. 2). These courses, originally called vocational agriculture, were first supported by the Federal Government in public high schools in 1917 under provisions of the National Vocational Education Act, known as the Smith-Hughes Act (Ross, 1939). The National Research Council reported that for many years, vocational agriculture programs have had a positive effect on tens of thousands of people: students, their families, and residents of local communities (National Research Council, 1988). The National Research Council further stated that "beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture" (1988, p. 2).

Frick, Kahler, and Miller (1991) identified 11 broad agricultural literacy subject areas, along with 394 concepts. These concepts "demonstrate the vast amount of knowledge from other disciplines that agriculture applies to produce food and fiber" (p. 56). Further, they recommended that "the concept lists should be further refined by subject matter specialists and educators interested in incorporating aspects of agriculture into their curricula. The manner in which concepts can be integrated into the K-12 curriculum should be identified" (p 56).

The first step in curriculum development, under the Johnson model (Posner, 1995) is goal setting. The educational goals and objectives set are more effective if the current knowledge level of the audience is understood. Frick, Birkenholz, and Machtmes (1995) noted, "The first step in improving the agricultural literacy level of a population is to determine the current literacy level... a bench mark that verifies the level of agricultural knowledge and perception should be determined" (p. 44).

This study provides a picture of the current literacy level of the students and teachers, along with their perceptions of agricultural issues.

Definition of Terms

Activities Integrating Mathematics and Science (AIMS): Non-profit educational foundation began in 1981 with a grant from the National Science Foundation to integrate curricular disciplines such as mathematics, science, language arts, and social sciences (AIMS

Educational Foundation, 1988). AIMS courses and workshops are available, along with curriculum materials and the AIMS magazine (History of AIMS, n.d.).

Agriculture: Of or relating to the production, processing, and distribution of food and fiber; also, the ecological science and conservation of the natural resources and environment (Knobloch, 1997). The areas that are included in the study of agriculture in secondary education are Agricultural Production, Agricultural Mechanics, Agricultural Sales and Services, Agricultural Processing, Horticulture, Natural Resources and Conservation, and Forestry (Phipps and Osborne, 1988). The term *food and fiber system* is used synonymously with the term agriculture (Leising & Igo, 1998).

Agricultural Literacy: Possessing knowledge and understanding of the food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture (Frick, 1990). The term *food and fiber system literacy* is used synonymously with the term agricultural literacy (Leising & Igo, 1998).

Ag in the Classroom: The United States Department of Agriculture program started in 1981 that provides materials and resources to incorporate agriculture into elementary classes which are independently organized and delivered in each state (About Ag in the Classroom, n.d.).

Benchmark: Statement identifying expected or anticipated skill or understanding relating to the Food and Fiber Systems at various developmental levels. May be declarative, procedural, or contextual in the type of understanding it describes (Leising & Igo, 1998).

The terms "standard" and "standards" are used synonymously with the term benchmark in this study.

Elementary: An educational level of students in grades kindergarten through sixth.

Fair: An annual celebration that incorporates agricultural exhibits, shows, or competition and at least two more of the following activities: Youth Programs, commercial and/or educational exhibits, competition in the fine and/or home craft arts, and a midway or entertainment area (International Association of Fairs and Expositions, 2001).

Food and Fiber Systems: Term used synonymously with the term agriculture (Leising & Igo, 1998).

Food and Fiber Systems Literacy: Term used synonymously with the term agricultural literacy (Leising & Igo, 1998).

Food for America: Program administered through the National FFA Organization to help introduce first- through sixth-grade students to agriculture. The program includes a presenter's guide, a video to introduce elementary students to agriculture and to Food for America, and lesson plans to help teachers incorporate the study of agriculture into existing curriculum areas (Food for America, n.d.).

Integration: The blending of a topic or subject into the current subject or class taught; teaching a topic/subject within an existing subject (Knobloch, 1997).

Links to L.E.A.R.N.: Published in 1999, the document identifies the "essential learnings" of six content areas, including agriculture. *Links to L.E.A.R.N.* (Nebraska State Board of Education, 1999a) aligns these "essential learnings" with Nebraska's reading, writing, math, science, and social studies/history academic standards.

National Research Council: Established in 1916 to associate the broad community of science and technology with the purpose of furthering knowledge and advising the federal government. Members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering (National Research Council, 1988). The report *Understanding Agriculture: New Directions for Education* was published by the National Research Council (1998).

Nebraska L.E.A.R.N.S.: The acronym L.E.A.R.N.S. stands for "Leading Education Achievement through Rigorous Nebraska Standards." Content standards identify what students in our schools are to know and be able to do and what teachers should teach (State Board of Education, 1998). Term used synonymously with the term "state standard."

Project Learning Tree: Program began in 1973 when natural resource managers and educators from the American Forest Institute (now the American Forest Foundation) and Western Regional Environmental Education Council (now the Council of Environmental Education) formed a partnership to develop an unbiased, educationally sound program for

elementary and secondary students and their teachers. The effort is now coordinated by the Project Learning Tree Foundation (Project Learning Tree Foundation, 2002).

Standard: Describes what a student should understand relative to Food and Fiber Systems (Leising & Igo, 1998). The standards identify what students in our schools are to know and be able to do (Nebraska Department of Education, 1998).

Limitations

The findings of this study are not transferable to different populations of teachers or students, due to its qualitative nature. The findings will give insight into the current understanding of students interviewed and used as a comparison to previous studies. The findings provide a basis for interpretation of a specific point in time and in the particular context (Merriam, 2002).

Patton (2002) describes purposeful sampling involves studying information-rich cases in depth and detail to understand and illuminate important cases rather than generalizing to a population (p. 563). What would be "bias" in statistical sampling, and therefore a weakness, becomes intended focus in qualitative sampling, and therefore a strength. Studying information-rich cases yields insights and in-depth understandings rather than empirical generalizations (p. 230).

Another limitation of this study is that the findings are based on the interpretations of the researcher. These interpretations are limited by the researcher's ability to accurately portray the understanding of the teachers from the verbal data generated in the interviews.

It is important to note the researcher's bias toward the significance of agricultural literacy activities. This bias, or subjectivity, will most likely influence interpretation of data and the conclusions and recommendations drawn from the study, unless disciplined through researcher reflection and peer debriefing. Rather than try to eliminate these biases or subjectivities, it is important to identify them and monitor them as to how they may shape the collection and the interpretation of data (Merriam & Associates, 2002).

II. REVIEW OF LITERATURE

Overview

Meischen (2002) noted that most Americans have not grown up within this culture of agriculture and, as a result, have not acquired basic agriculture literacy (p. 8). Similarly, Frick (1990) states that leaders of our society, today's and tomorrow's, know far less about the real impact of agriculture upon our society. That lack of agricultural knowledge goes beyond having the ability to correctly identify species of livestock. It translates into a general population which is ill equipped to make informed decisions about agriculture in their personal lives (National Research Council, 1988).

Messenger (2001) relays the method of how many consumers make decisions on issues such as food quality and safety. "Consumers smell with their eyes as well as their noses. If they drive past [a pork producer's] operation and don't see or smell a problem, they'll assume the best instead of the worst" (p. 32). Many Americans know very little about agriculture, including its social and economic significance in the United States, and particularly, its links to human health and environmental quality.

A well-informed population is better able to deal with economic, political, social, and environmental issues affecting agriculture and their own living standards and conditions. Students from all communities and towns across Nebraska have a significant dependence on agriculture. Because of this large dependence on agriculture and the tremendous impact of agriculture on the state economy, all citizens have a need to be knowledgeable of agriculture (Nebraska Department Education, Vocational Division, 1999, p.2).

A public which is well informed is important for many reasons. Today's consumers are faced with a maraud of technological advances and increased focus on conservation practices. Additionally, the public is faced daily with economical effects of agricultural market fluctuations, whether through price increases of food products or the effect on jobs related to the processing and production of agricultural products and supplies.

Consumers are not conscious of how their eating habits affect the way the planet's natural resources are used (Berry, in Trexler, 1999). Today's population is ill equipped to make informed decisions about food and fiber in their personal lives (Mayer & Mayer, 1974). A well-informed population is better able to deal with economic, political, social, and environmental issues affecting agriculture and their own living standards and conditions (Nebraska State Board of Education, 1999, p.2). Consumers as well as policy makers need to be more agriculturally literate in order to respond appropriately as issues arise. Most Americans, whether young or old, have limited knowledge about agriculture and food production (Frick, Birkenholz, Gardner & Machtmes, 1994).

Elementary students should receive education on food sources, as they are the future consumers (Ingram, 1992). Williams and White (1991) state that "agricultural literacy also includes enough knowledge of nutrition to enable an individual to make informed personal choices about one's diet and health" (p.9).

Agricultural Literacy

Literacy has many definitions. The National Research Council defines science literacy as "the knowledge and understanding of scientific standards and processed required for personal decision making, participation in civic and cultural affairs, and economic productivity" (1996, as cited by Carlson & Maxa, 1997). Frick defines agricultural literacy as "possessing knowledge and understanding of the food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture" (1990).

Only through effective educational strategies can we improve the "agricultural literacy" of individuals so they may sufficiently look at agricultural issues in the context of society's broad goals (Frick, 1990). If the improvement of America's agricultural literacy is to succeed, the knowledge and perception of agriculture should be assessed within various segments of our society (Frick, Birkenholz & Machtmes, 1994). The National Research Council (1988) recommended that "beginning in kindergarten...all students should receive some systematic instruction about agriculture."

Acquiring such agricultural understanding is a cumulative process that begins when people are very young (Trexler, 1999). The National Research Council (1998) reported that agriculture was not being taught in elementary schools. Knobloch and Martin (2000) stated that "integrating agricultural awareness activities into elementary education would provide learning opportunities and sound education based on experiences related to production and distribution of agricultural commodities and services" (p. 17).

Leising and Zilbert (1994) found that science and social studies were favored as the preferred curricular areas for the integration of agricultural concepts. They recommend that curricular development efforts should focus on the integration of agriculture with grade level specific curricula in science, social studies, and history (1994).

> For all students to achieve conversational literacy, all teachers in the school must include the study of agriculture in a relevant, integrated instructional approach. Today, approximately six percent of the school population successfully completes coursework in agriculture. For the other 94 percent of students to have the knowledge required for a lifetime of informed choices in agriculture, food, fiber and natural resources systems, a broad-based network of teachers, groups and organizations must collaborate to develop and disseminate contemporary agriculture curricula for all students. We must work with educators in all schools and all university teacher preparation programs to infuse agriculture across the educational spectrum. (National Research Council, 2000)

National Research Council Findings

The National Research Council (1988) found that the public lacks an understanding of the importance of agricultural policies. The report emphasized that agriculture was not taught in elementary schools. Finally, the report recommended, "all students should receive at least some systematic instruction about agriculture beginning in kindergarten or first grade" (National Research Council, 1988). Agricultural literacy is mandated in *The Strategic Plan for Agricultural Education* released in 1990 (Deeds, 1991).

Numerous reports indicate a need for increased science and social studies education in the elementary classroom. Both subject areas often include instruction on agricultural topics. Social studies and science educators have included agricultural concepts in the

curricula (Leising & Igo, 1998). For example, Carlson and Maxa (1997) cite using current events in agriculture as possible topics to be included in the curriculum. Sample topics include discussing the aspects of and implications of genetically modified crops, such as corn which is resistant to the bacterium Bacillus thuringiensis (Bt), in the science curriculum.

Agricultural Literacy Programs

Numerous groups have recognized the need to increase agricultural literacy throughout the American population. Tisdale (1991) noted that "whether education about agriculture is in formal classroom settings, in public forums, by multimedia or a combination of these, it must be done. The 'what' is more important than the where."

The majority of the efforts currently made focus on elementary age students. An example is the National FFA Organization's "Food for America" program. Food for America is a program designed by the National FFA Organization to help introduce first- through sixth-grade students to the fascinating world of agriculture. The program includes a presenter's guide, a video to introduce elementary students to agriculture and to Food for America, and lesson plans to help teachers incorporate the study of agriculture into existing curriculum areas (Food for America, n.d.). The program was one of the first national efforts to teach young students about the business of food and fiber (Stagg, 1991).

The "Ag in the Classroom" program strives to not only provide agricultural literacy activities and lessons, but also educate instructors on the importance of agriculture. In 1981,

the United States Department of Agriculture (USDA) established Agriculture in the Classroom, a grassroots program coordinated by the United States Department of Agriculture. Its goal is to help students gain a greater awareness of the role of agriculture in the economy and society, so that they may become citizens who support wise agricultural policies. The program is carried out in each state, according to state needs and interests, by individuals representing farm organizations, agribusiness, education, and government (About Ag in the Classroom, n.d.).

"We are an agricultural state," said Joe Beninato, a volunteer with Nebraska's Ag in the Classroom program, "Where we are today can be traced primarily to our rural heritage. Nebraska's success and prosperity continues to depend on a partnership between the rural and urban sectors. Our children need an early understanding of the importance of agriculture" (Rustler-Sentinel, Jan. 30, 2002, p.4).

Project Learning Tree (PLT), currently administered through the Project Learning Tree Foundation, began in 1973 when natural resource managers and educators from the American Forest Institute (now the American Forest Foundation) and Western Regional Environmental Education Council (now the Council of Environmental Education) formed a partnership to develop an unbiased, educationally sound program for elementary and secondary students and their teachers (About Project Learning Tree, n.d.).

PLT uses the forest as a "window" on the world to increase students' understanding of our environment; stimulate students' critical and creative thinking; develop students' ability to make informed decisions on environmental issues; and instill in students the

commitment to take responsible action on behalf of the environment (About Project Learning Tree, n.d.).

Activities Integrating Mathematics and Science (AIMS) began in 1981 as a project funded by the National Science Foundation at Fresno Pacific College to integrate mathematics and science in grades 5-8. The program later expanded as a permanent program to develop integrated math and science materials for grades K-9. In 1986, the AIMS Education Foundation was established as a non-profit, independent organization to administer this program (History of AIMS, n.d.).

Agricultural Literacy Concepts

In an effort to combat the lack of agricultural literacy among students, and following the recommendation of the National Research Council, a number of states developed agricultural literacy concepts. Among those states was Nebraska. In 1999, the Nebraska State Board of Education published the *Nebraska Agricultural Education Curriculum Framework and Content Standards*. Within this publication is a chapter entitled "Agricultural Literacy." One of the objectives outlined in the chapter is, "Identify a brief topical scope and sequences of agricultural literacy concepts that could be used to integrate agriculture into elementary classrooms" (Nebraska State Board of Education, 1999, p. 1).

The agricultural literacy concepts are further defined as a "brief, topical scope and sequence of agricultural literacy concepts that could be used to integrate agriculture into the

subjects of science, math, social science and language arts for Kindergarten through sixth grade" (Nebraska Department of Education, Vocational Division, 1999, p. 1).

In 1998, the State Board of Education published *Nebraska L.E.A.R.N.S.,* a document outlining approved standards in four core areas: reading/writing, math, science, and social studies/history. The acronym L.E.A.R.N.S. stands for "Leading Education Achievement through Rigorous Nebraska Standards." The content standards identify what students in Nebraska schools "are to know and be able to do and what teachers should teach" (State Board of Education, 1998). The content standards were dictated by the Quality Education Accountability Act, Sections 79-757 to 79-762 (Quality Education Accountability Act, 1998; Quality Education Accountability Act, 2000). Legislation requires that Nebraska school districts shall by July 1, 2003 adopt measurable quality academic content standards for reading, writing, mathematics, science, social studies, and history (Nebraska State Board of Education, 2002). The *Nebraska Agricultural Education Curriculum Framework and Content Standards* were later aligned with the standards outlined in *Nebraska L.E.A.R.N.S.* for 12th-grade students.

> Standards in only reading, writing, math, science and social studies/history are not enough to provide a full educational experience for our youth. We must also consider the Essential Learnings in areas not addressed by the standards.
>
> As we move toward assessment of our standards, it is important to recognize that just as a standard can be taught outside the four core areas it can also be assessed in other classes in various ways (Nebraska State Board of Education, 1999, p. 1).

Made available in December of 1999, *Links to L.E.A.R.N.* focused on six content areas, including agriculture, titled *Agricultural Education Essential Learnings*. The

Agricultural Education Essential Learnings linked only to *Nebraska L.E.A.R.N.S.* content standards for the 12th grade (Nebraska State Board of Education, 1999). *Links to L.E.A.R.N.* was not employed in this research, as the document did not align the "essential learnings" with the elementary content standards.

The agricultural literacy concepts listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* were developed through a synthesis of concepts outlined in the *Food and Fiber System Literacy Framework* (Leising & Igo, 1998). Extensive work was completed in the development of the *Food and Fiber System Literacy Framework*, which involved a number of educational entities.

> Teachers, curriculum specialists, school administrators and agricultural industry professionals were involved in the development of this Guide. Initial work was completed at the University of California, Davis. Further development and testing of the standards and benchmarks was completed in elementary and middle schools during the 1997-1998 academic year in Montana, Oklahoma, Pennsylvania and California under the leadership of Oklahoma State University (Leising & Igo, 1998).

Parents, educators, and the public were involved in the development of Nebraska academic standards in math, science, reading/writing, and social studies.

> In January 1997, the State Board of Education contracted with the Public Agenda Foundation of New York to conduct a series of eight focus group sessions, which led to a series of six town hall meetings statewide. Hundreds of citizens attending the meetings, participating in detailed conversations about standards and their implementation...In addition, parents and educators worked together to write the draft standards for us to review (Nebraska Department of Education, 1998).

It is important to note that in the adaptation of these benchmarks for use in *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska

Department of Education, Vocational Division, 1999), there was no additional testing of the benchmarks in Nebraska elementary schools. Further, the agricultural benchmarks have not been widely distributed among elementary teachers (L. Bell, personal communication, August 18, 2003).

While *Links to L.E.A.R.N.* did align the *Nebraska L.E.A.R.N.S.* content standards with the *Nebraska Agricultural Education Curriculum Framework and Content Standards,* the document linked only the content standards for the 12th grade (Nebraska State Board of Education, 1999). The agricultural literacy benchmarks, which are focused on students in kindergarten through eighth grade in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999), are not recognized by the Nebraska Department of Education as an academic content standard (L. Bell, personal communication, August 18, 2003). However, the benchmarks were published by the Nebraska Department of Education, Vocational Division (1999) as the only Nebraska agricultural literacy content concepts available for instructional use.

III. METHODOLOGY

Introduction to Methods

Agricultural literacy research has largely been conducted using survey techniques. This narrow view of agricultural education research is due to an over reliance on quantitative research methods, and validity concerns associated with qualitative research (Trexler, 1999). However, more recent paradigms have shifted to include qualitative inquiry. In a study by Hogan and Fisherkeller (1996), student conceptions of nutrient cycling in ecology were determined by analyzing student interviews. Trexler and Heinze (2001) and Trexler (1999) adapted and used these research methods in agricultural literacy assessment studies.

The overall goal of this research was to understand the interpretations and perceptions of fourth-grade elementary students and teachers at a particular point in time and in a particular context (Merriam & Associates, 2002). Three objectives were specified for this study, as follows:

1) Explore teachers and students' backgrounds and experiences, relative to agricultural literacy knowledge.

2) Determine how Nebraska fourth-grade elementary students' understandings of agriculture, or agricultural literacy, compare to goal concepts outlined by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

3) Determine extent of integration of agricultural concepts into the academic curriculum.

To reach these objectives, a methodological approach was required which would:

- Allow for in-depth exploration of the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).
- Capture the background of the students and teachers, to determine outside factors influencing perceptions of agriculture.
- Allow for the use of rich descriptions in explaining students' thought processes when addressing agricultural concepts.
- Accurately portray teachers' confidence or hesitations on integration of agricultural concepts.

Qualitative research methodologies were congruent to these purposes. Qualitative methods facilitate study of issues in depth and detail (Patton, 2002). Qualitative researchers develop concepts, insights, and understandings from patterns in the data, rather than collecting data to assess preconceived models, hypotheses, or theories (Taylor & Bogdan, 1998). Meischen stated that more studies that utilized qualitative research methods would allow researchers to more deeply understand students' agriculture literacy levels (2002).

Qualitative inquiry was appropriate in this study because qualitative studies are important for educational practice improvement (McMillan & Schumacher, 2001). Qualitative research describes and analyzes people's individual and collective social actions,

beliefs, thoughts, and perceptions. The researcher interprets phenomena in terms of the meaning people bring to them. Interactive qualitative research is inquiry in which researchers collect data in face-to-face situations by interacting with selected persons in their settings (Glesne, 1999).

A case study method, as selected for this study, is an intensive description and analysis of a phenomenon or social unit. A case can be a person, an event, a program, an organization, a time period, a critical incident, or a community (Patton, 2002). The process of conducting a case study begins with the selection of the "case." The selection is done purposefully, not randomly. In a case study, the findings are written up as a comprehensive description of the case (Merriam & Associates, 2002).

Data Collection

Exploratory qualitative research methods, specifically participant observation and in-depth interviews, were employed in this case study. Patton (2002) lists three types of qualitative data – interviews, observations, and documents. Interviews are defined as open-ended questions and probes, which yield in-depth responses. The resulting data consists of verbatim quotations (Patton, 2002). Observations include fieldwork descriptions of activities, behaviors, actions, conversations, and other aspects of observable human experience. Documents are defined as written materials and other documents, which include written responses to open-ended surveys (Patton, 2002).

In-depth interviews, open-response questions, and documents were used to obtain data of participants' meanings (McMillan & Schumacher, 2001). An interview format was used to elicit teachers' free responses to questions as well as allow for in-depth probing of those responses (Hogan and Fisherkeller, 1996).

The interviews took a semi-structured format. The semi-structured interview contains a mix of more- and less-structured questions (Merriam & Associates, 2002). An interview guide was utilized to obtain specific information from all of the participants (Merriam and Associates, 2002). An interview guide is not a structured schedule or protocol. Rather, it is a list of general areas to be covered with each informant (Taylor & Bogdan, 1998).

Key questions were set for the interview (Appendix C and D), while allowing for individual probing of responses. Interview questions were based on agricultural literacy concepts outlined in *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). These agricultural literacy concepts were created through syntheses of concepts outlined in the *Food and Fiber System Literacy Framework* (Leising & Igo, 1998).

Two 30-minute interviews were conducted with each student. Two 60-minute interviews were conducted with each teacher. The first five to ten minutes of the interview were reserved for background and demographical questions. Teacher and student interviews took place at the school, at a time set by the teachers. Pseudonyms have been used for the teachers involved in the study, as well as the school district.

Interviews were taped and transcribed for analysis. A tape recorder allows the researcher to capture more than he or she could by relying on memory (Taylor & Bogdan, 1998). Field notes were taken by the interviewer to back-up the taped interviews. In addition, any products that the students drew or wrote during the interview were collected and used to complement the transcript analyses (Hogan & Fisherkeller, 1996). District mandated curriculum or units, lesson plans, materials, and textbooks, provided by the instructors, were also collected. Teachers were asked to write a statement, reflecting on what agriculture means to them, their experiences with agriculture, and their hesitations when teaching agriculture.

This study, including all interview questions, was reviewed and approved by the Institutional Review Board at Iowa State University. All subjects were treated in accordance with University policy and Federal regulations for treatment of human subjects.

Describing Research Variables

A case study approach to qualitative research allows for an intensive description and analysis of a phenomenon or social unit (Patton, 2002). The goal of the study is not to formally measure variables. Rather, the researcher attempted to paint a picture with words to describe the variables in a specific situation.

The first research objective in this study explored students' backgrounds, experiences, and sources of agricultural literacy knowledge. This objective, also, provided a snapshot of

the teachers and students' outside influences. Falk, in Eberbach, 1997, discussed the personal context in which learning occurs. He stated the personal context is "the stuff you bring with you...that informs you how to think about the information you get from your environment" (p.7). Slavin (1997) states "by the time children enter school, they have absorbed many aspects of the culture in which they were raised" (p. 113). Understanding the learner's background is critical as ones personal experiences and feelings on agricultural issues, positive or negative, will greatly influence their ability or willingness to take in new information.

The second objective aimed to determine how Nebraska fourth-grade elementary students' understandings of agriculture, or agricultural literacy, compare to goal concepts outlined by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). In the interview guide, specific agricultural questions were adapted from the goal concepts outline in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). The answers were not measured for accuracy, rather to gain an understanding of the teachers and students' thought processes in regards to the agricultural food and fiber system. Additionally, detailed descriptions showed how confident students and teachers were in their understandings.

The third and final objective sought to determine the extent of integration of agricultural concepts into the academic curriculum. This objective was not intended to measure a comprehensive review of the classroom's curriculum. This study provided a narrow view of the food and fiber topics addressed in the classroom, through a formal

curriculum and informal classroom discussions or activities. The study gave a snapshot of the teachers' willingness to teach agricultural concepts, as well as their confidence in approaching agricultural topics. Finally, the study observed where, in the curriculum, agricultural concepts and topics were addressed.

Respondents

In this study, six teachers and six students were interviewed, chosen from school districts in the Educational Service Unit (ESU) #2, in eastern Nebraska. The ESU #2 serves 20 schools within Burt, Cuming, Dodge, and Saunders counties (See Figure 2).

The ESU #2 area was purposely chosen, as it serves rural elementary schools within eastern Nebraska. The individual teachers were purposefully selected, based on the school principal's recommendation of teachers who represent a range of experiences. In many cases, there was only one teacher in each grade level. Six fourth-grade elementary teachers were interviewed. Additionally, six fourth-grade elementary students were interviewed (See Table 1).

All of the teacher respondents were female. Similarly, State-wide in Nebraska, 86.52% of the elementary teachers are female, with 13.48% being male (Nebraska Department of Education, 2000). Statistics were not available showing racial classification of Nebraska elementary teachers.

Three of the students respondents were female, while three were male. These demographics are similar to the total student populations, a combined review of the six school districts, which were involved in the study, in the year 2000, find that 50.83% of all students were female, while 49.17% were male (National Center for Educational Statistics, 2003). All of the student respondents were Caucasian. This compares to 97.9% of the students in the six school districts were classified as "white" (National Center for Educational Statistics, 2003).

Table 1. Respondents (teacher and students) from ESU #2 schools.

Teacher	**Gender**	**Student**	**Gender**	**School**
Kate	Female	Brandy	Female	A
Christina	Female	Jim	Male	B
Jackie	Female	Robert	Male	C
Lisa	Female	Angie	Female	D
Dana	Female	Adam	Male	E
Ann	Female	Kelsey	Female	F

Nebraska has a rich and diverse agricultural history. The products that are raised here are diverse, and representative of the ingenuity of Nebraska producers to address the varied climate and geology found in this state. Field crops, like corn and soybeans, fair particularly well in the rich, fertile farmlands of the Platte Valley, but can be found in most parts of the

state. Producers also raise grain sorghum, mostly in the south; potatoes in several areas that have pockets of sandy soil; and wheat, sugarbeets, and dry edible beans in the more arid Panhandle and southwest.

Nebraska's animal industry is also strong. Cattle can be found in all of Nebraska's 93 counties, and thousands of cows and calves spend their spring and summer grazing in the rolling, lush pastures of the north central Sandhills region. Swine, dairy cattle, and poultry also are in abundance and are generally raised in the more diversified, eastern part of the state (Nebraska Department of Agriculture, 2001).

The four counties, Burt, Cuming, Dodge, and Saunders, all sit in eastern Nebraska. The top four agricultural commodities for all are cattle and calves, hogs and pigs, corn for grain, and soybeans (USDA, National Agricultural Statistics Service, 2003).

Interview format

Getting into a setting usually involves some sort of bargain–explicit or implicit assurances that you will interfere in their activities (Taylor & Bogdan, 1998). In this study, the researcher provided assurance that the interviews would not take too much time out of the teachers' schedules. The administrator and teachers were also assured that they had complete control over the scheduling of interviews. Two 60-minute in-depth interview sessions were conducted with each teacher, with students being interviewed for two 30-minute periods. In-depth interviewing is defined as the face-to-face encounters between the researcher and informants directed toward understanding informants' perspectives on their lives,

experiences, or situations expressed in their own words (Taylor & Bogdan, 1998). It was important for the researcher to understand the teachers' experiences with agriculture, as well as their experiences in presenting agricultural concepts to students. Interviews were taped and transcribed for analysis. Field notes were taken by the interviewer to back-up the taped interviews.

By virtue of being interviewed, people develop new insights and understandings of their experiences. They may not have thought about or reflected on events in which the interviewer is interested (Taylor & Bogdan, 1998). Each of the teachers were asked to write a reflective statement (See Appendix D), which allowed the teacher to reflect on their experience with agriculture, their personal definition of agriculture, and their confidence and/or willingness in teaching agricultural concepts. Four reflective statements were returned. Two teachers declined to return the statements. District academic standards and classroom textbooks, when available, were also reviewed.

Six elementary students, in the fourth-grade, and their instructors were interviewed for the study. The students and instructors were purposely chosen from six public elementary schools from the Educational Service Unit (ESU) #2, Nebraska.

Pilot Study

Prior to the selection of respondents and collection of data, a pilot study was completed. A pilot study involves a small-scale testing of the procedures that you plan to use

in the main study, and revising the procedures based on what the testing reveals (Patton, 1985, p.65).

The goals of the pilot study included:

- Identify the key questions and issues of participants, concerning agriculture and agricultural literacy.
- Identify significant areas of inquiry that would assist the researcher.

The pilot study looked at two fourth-grade elementary teachers in central Iowa. The pilot study found that the teachers had difficulty understanding the wording of the concepts. Additionally, the pilot study also identified which questions produced a hesitant response, or which questions the participants were reluctant to answer.

Student questions were tested with two fourth-grade students. This pilot study questioning allowed the researcher to determine the best wording or terminology to use with students in the fourth-grade level.

CHAPTER IV: FINDINGS

Chapter four will be divided into two distinct sections, which will examine the responses of teachers and students separately. The first section looks at the feedback given by teacher respondents. The teacher respondent section looks at the demographic background of the students, in order to understand the background and experiences of the teachers. The section then looks at the integration of agricultural material into each of the teachers' current curriculum.

Following this, the section review the teacher respondents' integration of the following six agricultural literacy concepts outlined in *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999): the Nebraska agriculture concept, agribusiness/economics concept, conservation/ environmental concept, crop production concept, food science and technology concept, and livestock production concept. Within this, the section also looks at other topic areas, in which agriculture has been integrated into the curriculum.

The section also reviews the teacher respondents' definitions of agriculture, their personal views on the importance of teaching agricultural concepts, and their comfort level in teaching the agricultural concepts. Finally, the section looks at teachers' viewpoint on the Nebraska Academic Standards and textbooks in the classroom.

The second section looks at the responses provided by the student respondents. This section first reviews the demographic background and then examines student respondents' knowledge of the following seven agricultural literacy concepts outlined in *Nebraska*

Agricultural Education Curriculum Framework and Content Standards (Nebraska State Board of Education, 1999): the Nebraska agriculture concept, agribusiness/economics concept, conservation/environmental concept, agricultural exports and imports, crop production concept, food science and technology concept, and livestock production concept. This section also reviews the student respondents' definitions of agriculture.

Looking at teacher and student responses separately allows the researcher to explore each component independently, while also allowing the reader to draw his or her own conclusions. A summary of findings will follow each of the student and teacher response sections.

For the purpose of this study, the term "standard" will refer to the Nebraska State Academic Standards, as outlined in *Nebraska L.E.A.R.N.S.* (Nebraska State Board of Education, 1998), while the term "concept" will refer to the agricultural literacy concepts outline in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

Throughout this chapter, the researcher will provide background information pertaining to each educational concept outlined in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* along with the *Food and Fiber System Literacy Framework*, when necessary.

Fourth-Grade Elementary Teachers' Responses

Demographic Background

It is important to understand a teacher's background and experience, as they play a significant role in educating students about agriculture (Knobloch & Martin, 2000). Prior literature indicates that teachers who possessed experiences in agriculture had more agricultural knowledge and more accurate perceptions of agriculture (Terry, Herring, & Larke, 1992). Harris and Birkenholz (1996) stated, "educators who lack a background in agriculture may be reluctant to incorporate instruction about agriculture into their curricula" (p. 64).

Individual pseudonyms were assigned to each teacher and each school. Teachers will be referred to as Kate (school A), Christina (school B), Jackie (school C), Lisa (school D), Dana (school E), and Ann (school F). All of the teacher respondents were female.

All of the schools involved in this study are located in rural areas, and each study participant lived in the rural area. Lisa and Jackie both lived on working farms. Kate lived on an acreage, while Dana, Christina, and Ann all lived inside city limits. Lisa and Jackie were heavily involved in the daily operations of their farms, though their participation dwindled when returning to teaching full-time. Three of the teachers, Kate, Christina, and Lisa, spent their childhoods on farms. Jackie, Dana, and Ann each spent their childhoods in rural towns. Dana and Ann stated that their mothers had large gardens.

In terms of professional development related to agriculture, two of the teachers, Ann and Lisa, had previously participated in an Ag in the Classroom workshop. Kate, Dana, Ann, and Lisa had utilized Activities Integrating Mathematics and Science (AIMS) materials in the classroom. Ann attended a Project WET and Project WILD workshop. Lisa and Ann stated they utilized materials and guest speakers from commodity groups. Christina and Lisa have utilized materials and speakers from the county extension service. Additionally, Kate and Christina have brought other guest speakers into the classroom to discuss topics related to agriculture.

Of those that had utilized materials promoting agricultural literacy, they reported the materials were primarily used as a one-shot resource – used once and then forgotten. Teachers indicated that materials sent to them without follow up were generally unused in the classroom. They indicated a need to be approached personally and, at least initially, provided with someone to assist the teacher in learning the materials.

Four of the teachers, Kate, Lisa, Dana, and Jackie, all indicated a high comfort level with teaching agriculturally based curricula. By contrast, Christina and Ann indicated a lack of confidence in presenting agricultural materials and information.

All of the teacher respondents had ten or more years of teaching experience at the time of the interview, with Kate, Lisa, and Dana having twenty years or more of teaching experience (See Table 2).

Table 2. Teachers' demographic information

Name	School	Gender	Home Location – as a child	Home Location – as an adult	Years Teaching	Agriculture Groups and Materials used, at least once, as Resources
Kate	A	Female	Working Farm	Acreage	28	AIMS Materials; Guest Speaker
Christina	B	Female	Working Farm	Rural Town	11	County Extension; Guest Speaker
Jackie	C	Female	Rural Town	Working Farm	16	None identified
Lisa	D	Female	Working Farm	Working Farm	34	Ag in the Classroom Workshop; AIMS Materials; Commodity Group; County Extension; Guest Speaker
Dana	E	Female	Rural Town	Rural Town	20	AIMS Materials
Ann	F	Female	Rural Town	Rural Town	10	Ag in the Classroom Workshop; AIMS Materials; Project WET and WILD Workshop; Commodity Group

Agriculture Integration in the Elementary Curriculum

There is a multitude of research identifying the need for agricultural awareness among all facets of the population, including elementary students. According to the National Research Council (2000), just as education provides the vehicle to move us toward prosperity, agriculture provides the foundation we need to survive and prosper through an abundant, nutritious, and safe food supply and a healthy, sustainable environment.

Knobloch and Martin (2000) noted the need to understand teachers' awareness and views of agricultural material: "If teachers are change agents for integrating agriculture into the elementary curriculum, then their perceptions about this process and the associated activities would affect the integration of agriculture into the elementary curriculum" (p. 19).

As teachers are the primary individuals introducing this material to their students, it is imperative to understand teachers' perceptions of agriculture. Furthermore, it is equally important to examine teachers' perceived ability to integrate agricultural materials into the curriculum and their willingness to do so. In addition, acknowledging systematic constraints on teachers with respect to curriculum decision-making is key:

> Elementary teachers generally have little time left after covering the required core curriculum. Introducing instruction about agriculture as a separate subject in the elementary school curriculum would worsen existing time pressures and would not be welcomed by teachers or principals. Curriculum integration is a more reasonable approach to achieve the agricultural literacy goal...
>
> Elementary students should benefit from agricultural instruction through integrating into the existing curriculum. In elementary grades, instruction about agriculture should be integrated into daily instructional programs of math, science, social studies, art, writing, reading, etc. This integration not only provides real life application of the basic skills curriculum, but also provides an awareness of the integral role of agriculture in every day life. (Nebraska State Board of Education, 1999, p. 2)

The following sections present teacher-level findings from this study that were relevant to each of the Nebraska concept areas relating to instruction about agriculture.

Agricultural Concepts in the Elementary Curriculum

When asked whether they taught agricultural topics in their classroom, all of the teachers could identify lessons that were agriculture related. Furthermore, each of the

teachers noted that the majority of their agricultural topics were being taught within the social studies and Nebraska history units. Jackie stated, "I know that a lot of this is covered in their Nebraska history [unit] that they do in fourth grade."

According to Ann, the fourth-grade Nebraska history unit introduces agriculture from a historical base: "During the Nebraska studies, we usually do a pretty big farm unit going back, clear back to the Indians and going up to present day." By contrast, Ann regards the social studies units as introducing agriculture on a regional basis. "We also have to study the US regions and we do talk about agriculture, current agriculture in each region."

Kate provided her perspective about the social studies integration:

> [The agricultural material] comes from our social studies and on Nebraska studies. I really enjoy doing the Nebraska studies and so we get into a lot of details about where you live because I believe that, you know, 80% of these kids are going to live here all of their lives. So they need to know what their state is about. It is fine to know about the Liberty Bell and what is happening in the Far East, but I think it is important that they know what is happening in their state. Eighty percent of them are going to live here all of their lives. They need to know what this state is like and what is here.

The Nebraska history unit outlines the history of Nebraska, according to Lisa, beginning with the Native American tribes in Nebraska and the settlement by European pioneers.

> We will be talking about [areas of land use in Nebraska] – the corn belt and the Sandhills, the alfalfa country, Republican River Valley and the Panhandle as it goes. They will be doing a project to build a [elevation] map of Nebraska, so they can actually see the elevation from the corn belt to the panhandle.

Dana discussed her teaching of agricultural topics in social studies as a more indirect way to incorporate agricultural learning:

> Um, [we teach agriculture] indirectly. We wouldn't say we're having an ag class now... [in social studies] we do a lot with geography and global issues and trade and import, export. Most of that is based on agriculture. Working at the geography of the land; [social studies] is what it is going to be. What are the products, you know, products maps, we do a lot with that. And again our careers, I think we do a lot with careers, you know, how important it is and what is the basis, you know, for our state or community. So, yeah, indirectly. And we use the word agriculture, but we don't say it is agriculture [instruction].

Nebraska Agriculture Concept

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* lists the Nebraska Agriculture Concept as one of the six agricultural topic areas that "could be used to integrate agriculture into the subjects of science, math, social science and language arts for Kindergarten through sixth grade" (Nebraska State Board of Education, 1999, p.2). Within this concept, two specific examples are given for third through fourth grade (p. 3).

1. Explain basic process from producer to consumer.

2. Fun facts that encompass each of the agriculture sectors.

Four of the six teachers stated that they explained the basic process from producer to consumer in class. For example, Kate discusses food processing within her Health and Science unit: "We discuss where some of these foods come from, how they are processed. We also discuss that some [foods] have more salt and additives in them than others."

For Christina, textiles provide a way to present this information: "[In science] we talk a lot about combines and fields and then they get into cotton field. So, I actually have to

bring cotton in and talk about how the combines… then what is made out of cotton, for the shirts."

Although Dana did not specifically cover this topic, she touched on it because she thought that her students would have a difficult time with the concept, even though it was an important one to grasp: "They are still going to have a hard time with producer to consumer. And they should actually know that exact terminology…I think that the Producer to Consumer is a really good one in the new standardized testing that comes up. And so they can transfer that, you know, to other industries."

Jackie does not cover the process in the classroom and was unsure if her students would have that knowledge:

> The process of meat getting to the dinner table - depends upon the child. As a whole, I think by fifth grade they would know. But sometimes, you know, if there is a child who has grown up strictly in the city or that type of environment, it might be a questionable thing whether or not they really do. I would think by fifth grade everybody would know that. If they know it, they have learned it at home.

With the exception of Lisa, the teachers were unsure of what would be considered "fun facts that encompass each of the agriculture sectors", as listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standard* (Nebraska State Board of Education, 1999, p.3). The notions of "fun facts" as well as "agriculture sector" were unclear to the majority of the teachers, as evidenced by Kate and Jackie's comments below:

- "Fun facts that encompass the agriculture sectors. What do you mean by that?"
- "I don't know what you mean by the agriculture sectors."

Three of the teachers noted including an explanation of "basic processes from producer to consumer" in their curriculum, by looking at either crop or livestock production. Two of the teachers believed that their students would have a difficult time explaining the progression from producer to consumer.

Lisa is the only teacher respondent that noted including "fun facts" in her curriculum. This may correspond with her being the only teacher respondent whom had been involved as a member of an agricultural commodity group. Lisa mentioned her previous involvement with a pork producer's commodity board. She noted that this allowed her to be aware of numerous educational activities, showing interesting facts about the pork industry, along with being aware of agricultural statistics and rankings. However, Lisa was using outdated materials and had not secured current educational materials produced by the commodity groups. She had procured current agricultural statistics and rankings, though.

Agribusiness/Economics Concept

The second concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Agribusiness/Economic Concept" (Nebraska State Board of Education, 1999, p.3). Within this concept, two specific examples are given for third through fourth grade.

1. Identify agricultural businesses.
2. Field trip to an agriculture business.

In her classes, Lisa looks at businesses that have an impact on the State's economy, to discuss the agricultural industries and manufacturing in Nebraska: "We talked a great deal

about business, with ConAgra as one of our biggest companies in Nebraska that deals with agriculture. Through [the] internet, I can pull it up and get the top ten businesses."

Kate discussed with her students the agricultural industries and manufacturing in Nebraska:

> I have the kids tell me how many of their parents, how many...live on a farm or your parents have...a job that is tied into agriculture. But then we talk about what they are and then as we go on, we find out..."my dad works at the tire shop". Well, that is tied into agriculture because they need tires for their truck or tractor. When you live in a community like where we are today, almost, you know, most of the jobs will tie back into agriculture. And that is so true, maybe not as much as it was 50 years ago, but it still is true. So that is something we do bring out.

Additionally, Kate noted that she works to point out the variety of agricultural commodities produced across the state.

Ann was unsure if her students could identify agricultural business, as it was not discussed in her class. "Um, they might know some of the agricultural businesses from home." Similarly, Jackie and Christina stated they did not identify agricultural businesses in class since they believed their students are learning the information outside of school. As Jackie stated, "I think because of the small town, the locale, they would know what agricultural businesses are."

Although she does not cover agricultural businesses in class, Christina was confident that, if asked, her students would be able to identify agricultural businesses. At the same time, she was aware that students may need prompting and would likely not have a diverse definition. She noted

> They might not be able to identify an agriculture business immediately, but after we have been talking about it, they could. I think over all, they would have a good general idea, on their own, and then we would have to branch out to really perfect it.

Dana did not think that her students could identify agricultural businesses, though she felt it is important for the students to know: "They are living here; they need to know their place." She also noted that the large and small cities alike in Nebraska are agriculturally based communities, making it important for all students to understand the agricultural businesses: "I don't think it matters if it is an urban or rural community thing."

None of the teachers reported taking field trips to agricultural businesses, primarily due to concerns with safety or the cost of the trips. Lisa expressed an interest in taking her students through a nearby meat packing facility:

> I don't know if they take tours anymore through there because of [safety] concerns...I wish kids could see that. They would learn a lot. I don't take a field trip to [an agricultural business] but I think that would be important.

The cost of field trips, primarily busing costs, greatly limited the number of trips teachers could take. According to Ann, "If busing wasn't a concern, there probably would be room for [field trips to agricultural businesses], but [not] with our current budget."

Jackie doubted that the majority of classes have the opportunity to take a field trip to an agriculture business: "I am not so sure that you can say that every [class] has had that. In fact, my guess is that it is not one that is done on a basis, you know, on a yearly basis."

Two of the teacher respondents acknowledged that the identification of agricultural business is a part of their curriculum. All of the respondents, with the exception of Dana, suspect that their students would be able to name agricultural business, based on their experiences living within a rural community. Teacher respondents stated they were not taking field trips to agricultural businesses, nor did they see is as a realistic goal, given the budget concerns in education.

Conservation/Environmental Concept

The third concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Conservation/Environmental Concept" (Nebraska State Board of Education, 1999, p.4). Within this concept, three specific examples are given for third through fourth grade.

1. Identify Nebraska threatened and endangered species.
2. Importance of planting trees.
3. Cause and effects of pollution.

Lisa indicated lessons on threatened and endangered species are included in her curriculum, through they do not look at species specifically within Nebraska, as indicated in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Department of Education, 1999).

Kate focused on one endangered species in Nebraska and was able to tie the lesson in with the class field trip:

> We have talked about endangered species; there is a dung beetle that is endangered and we talked about that. We also when we went, we took a field trip to Morrill Hall [a museum which contains items relating to Nebraska history] and [the museum staff] talked about those things.

Ann's class touches on Nebraska's threatened and endangered species, "depending on how much time we actually have to do the Nebraska unit. It kind of gets pushed aside sometimes so that we can get the US geography done." Ann also discussed rain forests and the products that come from them, as well as the overall importance of trees: "We have been talking lately [about] ecology and relating it to forest and trees; and how we use trees and the products that you can get from that."

All of the teachers indicated that they talk about trees during Arbor Day activities. Lisa noted that on Arbor Day, "we have a special program and we will plant a tree out there. I showed them a fifteen to twenty minute film on who started Arbor Day, J. Sterling Morton."

Both Lisa and Christina discussed the importance of trees within a broader discussion of agricultural conservation practices, in the social studies curriculum. For example, Lisa said

> The other [social studies] unit is on conservation, the importance of planting trees to stop erosion, grass waterways. We sometimes have a speaker come in and talk to them about contour farming and some of the practices of strip farming, why they alternate soybeans one year and corn.

Lisa also stated that her students discuss in class the cause and effects of pollution as well as the decomposition process: "We are also doing a science experiment. [The students] are going to be using different materials to see how they decompose." Ann and Jackie also discuss the cause and effects of pollution, through the science curriculum. Jackie noted that, "causes and effects of pollution is definitely covered, in science, more than once." Kate indicated that her students could identify the cause and effects of pollution, though it is not discussed in class.

Crop Production Concept

The fourth concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Crop Production Concept" (Nebraska State Board of Education, 1999, p.4). Within this concept, three specific examples are given for third through fourth grade.

1. Identify local crops grown in Nebraska.

2. The importance of water and its origination.

3. The effect of climate on crops, both positive and negative.

Lisa stated that her students, in class, identify crops grown locally. Kate works to introduce students to crops grown throughout Nebraska, within the social studies curriculum:

> I try to tell also that there is diversity in Nebraska. Not only here in the northeast part of the state. Many of the kids think that everybody in the state grows soybeans and everybody grows corn. And we talk about sugar beets and pinto beans and that type of thing...grown in the western part of the state. And how this state has such a variety of crops, not just two or three, and they all play a part in the agriculture in Nebraska.

The social studies curriculum is also were Ann introduces crop identification. Jackie was unsure if local crops are specifically discussed in class: "Local crops grown, I am guessing they would know. I don't know that is covered as a subject anywhere. If anywhere, it would, again, [be in] Nebraska history."

Christina compares crops grown locally, such as corn and oats, with crops grown outside the state, such as cotton and peanuts. Christina noted, though, that most of her students "didn't even know what a corn leaf looked like. I brought that in when we were studying plants, or leaves, to run the vein up. They had no idea."

Dana stated unless her students lived on a farm, they would generally be unable to identify local crops grown. She felt strongly, though, that "100% of the class" should have the ability to identify local crops, regardless of where they reside.

Students in Lisa's class identify the importance of water, and its origin: "We have done water; sometimes I even have a speaker come and talk about...the analysis of water and our water table in Nebraska. We talked about...how other countries compare with

Nebraska." Kate also indicated that her students could identify the importance of water and its origin. Her students also become familiarized with the Nebraska aquifer.

Ann's students learn about the importance of water within both the science and social studies curriculum, while Jackie's students cover the topic in their science lessons.

Lisa discusses the effect of climate on crops, particularly during the social studies lessons, as they discuss what crops grow best in a particular region. Kate indicated her students could identify the effects of climate on crops, both positive and negative, though it is not discussed in her class.

Within the social studies curriculum, Ann's students study the various regions of the country: "We talk about how the climate and different type of weather in each region would affect crops." Dana's students look at the different factors affecting plant growth, within the social studies units.

Jackie touches on "the effects of climate on crops, in a roundabout way [in] science, when they talk about climate."

Food Science and Technology Concept

The fifth concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Food Science/Technology Concept" (Nebraska State Board of Education, 1999, p.5). Within this concept, three specific examples are given for third through fourth grade.

1. How does grain become food?
2. Is our food safe to eat?
3. The food chain.

Lisa stated that her students use an activity to understand the process of how one grain becomes food. "We did a little booklet on corn and how it becomes cornflakes."

Kate also uses the 'corn to cornflakes' example when teaching students how grains become a food product:

> We have been talking about processing plants and what some of these different products are used for. Like the corn, we talk about corn flakes, what you eat for breakfast, and that type of thing. We are talking about, like for example corn, we have been listing products...that come from corn.

Christina discusses grain production primarily by examining the cotton plant. A former student provided a dried cotton plant, which she uses as a visual:

> I actually...bring cotton in and talk about how the combines are different when they pick cotton compared to our combines that pick corn and soybeans. They get into more of that and then what is made out of cotton, [such as] for the shirts.

Jackie does not specifically cover the process of how grain becomes food, but believed most of the students would understand the concept: "How does grain become food? I think they know that [concept]...[but] this one is questionable."

Lisa discusses food safety, from the standpoint of the need to wash fresh vegetables and fruits to reduce chemical exposure.

Kate and Jackie stated they did not teach food safety issues and were unsure if their students would have that knowledge. "Is our food safe to eat? Now that is one that I would question whether that has been taught up until this point."

Dana looks at food safety in class from a position of concerns with the global food supply and terrorism:

> I think the food safety issue might be something that...is turning into a bigger topic. I mean, even after 9/11 when we started, you know, looking at water

> sources or feed supplies. And there again how that food supply...crossing boarders and what a difference that makes in food safety.

Ann was the only teacher that stated she teaches the food chain in class, though all of the teacher respondents felt their students came into the fourth grade with sufficient knowledge on the food chain, as Kate stated: "By the third or fourth grade, they understand the food chain."

Livestock Production Concept

The sixth, and final, concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Livestock Production Concept" (Nebraska State Board of Education, 1999, p.5). Within this concept, three specific examples are given for third through fourth grade.

1. Understand the process of meat getting to the dinner table.
2. Identify groups of livestock and their names (e.g. litter, herd, flock).
3. Nebraska history and rank.

Kate and Lisa both discuss the process of how meat gets from the farm to the dinner table, primarily using beef as an example commodity. Lisa provides an example:

> They write a story, on a paper of a big steer, and [about] how did that steer get to [the table]. The rancher fed his calves, and the process that it gets to a feedlot, and then we have to go to the [beef processing facility].

High school students from the local FFA Chapter gave a presentation to Ann's students to discuss the process of meat getting to the dinner table. This was the only lesson they had on the process.

Ann introduces the names of animal groups within the students' spelling lessons. Jackie does not introduce livestock names and groupings and was unsure if students had that knowledge: "I am guessing, and it is just a guess, they would know the names of the livestock."

Kate does not specifically identify, in class, groups of livestock and their names, but felt the students were competent in this area. "We have a lot of working farms in this area, so I think that is just a process of living." Her students discuss the state rankings of various commodities:

> We do Nebraska history and we are talking about, like I said, we are number one in beef production and corn and soybeans and that was something that was covered in the Weekly Reader and we have been discussing it.

Lisa's students identify animal groups through a chapter on wildlife, covered during the Nebraska history unit, in addition to looking at the names of livestock groups:

> The wildlife [chapter] is next. That becomes a fun chapter for them, as they find out that catfish is the main fish for Nebraska. We divide up into different categories of fur bearing animals, birds, fish, the deer, and wildlife.

Lisa stated that her students discover how Nebraska ranks in production of various commodities, by viewing the state rankings on cards. Lisa was unsure of which group provided the cards, though stated she was sent a postcard each year to remind her to request the materials: "We have each of the students will get a card on where we rank in soybeans and in beef and in corn production and you know, that changes from year to year too."

Ann and Jackie stated they did not discuss the ranking of commodities, though do cover some areas of Nebraska agricultural history within the Nebraska history unit. Jackie

reported that her students would have a good grasp on this material to some extent: "I think most of them students would know some of [the history of agriculture in Nebraska]...it depends on how in depth you want them to have this information."

Other Agricultural Areas

Two of the respondents noted their use of agriculturally-relevant examples to reinforce learning in mathematics and economics, respectively. Jackie has, in the past, used agricultural terminology in science and mathematics examples:

> I have in the past, especially when I know...that there are students within the classroom that are very much interested in farming, I will bring up things like, 'well you have to know the difference between gallons and pints, in order to mix your herbicide or to mix up the insecticide'.

Dana's agricultural instruction tends to focus on the global economic impact of agriculture, instead of having students look at production agriculture:

> We do a lot of current events in the morning. I think if you pick up the newspaper any morning and you start going through, whether it is the middle section or world news, you are going to get into a lot of economic problems we are facing or political pressures, like the farm bill. So, and the kids are very much aware of it. You know, they started it at the beginning of the year and the more they know that that is going to be a part of [the lesson, they] start picking [print media] up.

Definition of Agriculture

There are numerous established definitions of agriculture found in the literature. Frick (in Balschweid, et. al., 1998) defined basic agricultural knowledge as including: "production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment,

the marketing and processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agriculture products" (p. 2).

Knobloch (1997) defines agriculture as "of or relating to the production, processing, and distribution of food and fiber; also the ecological science and conservation of the natural resources and environment" (p. 12). The areas that are included in the study of agriculture in secondary education, according to Phipps and Osborne, are Agricultural Production, Agricultural Mechanics, Agricultural Sales and Services, Agricultural Processing, Horticulture, Natural Resources and Conservation, and Forestry (p. 5). The term *food and fiber system* is used synonymously with the term agriculture (Leising & Igo, 1998).

Though these definitions are widely accepted within secondary and post-secondary agriculture education, there is no criterion definition used within elementary textbooks. In the social studies textbook *Social Studies: States and Regions* (Boehm, Hoone, McGowan, Browning, Miramontes, & Porter, 2002), the text's glossary defines agriculture as "farming" (p. R31). Further, an agricultural economy is defined as "an economy in which people meet most of their needs by farming" (p. R29).

It was previously noted that the teacher respondents reported receiving most of their knowledge about agricultural through life experiences. Therefore, it would be reasonable to assume that their definitions of agriculture will vary greatly based on those experiences. This study looked at the aspects of agriculture that the teacher respondents are teaching within their curricula. Aspects which are chosen will likely be based on the teachers' own definitions of agriculture.

When asked for her definition of agriculture, Lisa acknowledged that a definition of agriculture is vast and, initially, struggled to put an entire definition into words:

> Agriculture could be the land, it could be the livestock, it can be just a pyramid of everything that is produced on land....But I would say it is just a pyramid of what to produce on your land all the way to what you raise...I am thinking of the cycle that we go through, you know, when you have to have something, it just creates a picture of a circle. One thing depends upon another and another depends upon the other, a life cycle.

Similarly, Kate's definition focused on production agriculture, while noting that the entire production process is a part of the definition:

> Well if I was telling my students, I would say it would be the study of production of crops. And when you talk about crops, not just grain crop...also livestock. And how they are grown and how they are, you know, how they are produced and how they are processed and so on. The whole process would be, to me would be agriculture.

The teachers' definitions of agriculture focused primarily on production agriculture, as shown through Christina's definition: "growing crops and livestock." Similarly, Ann defined agriculture as the "raising of any kind of crop or animal...including forestry, in a way to grow things that we need."

Jackie defined agriculture as the "study of the rural area and all of the different branches that put into what it is to be a farmer, or anything associated with farming." Dana's definition was broader, discussing the businesses supporting production agriculture:

> Agriculture is our food source for the world. And so it is beyond that farmer is everything, it is the processing, my husband is in agri-business, selling grain bins and leg systems. But every facade, it is not just the farmer planting his corn and beans or the cattle feeder. So it is the entire process.

Generally, each of the teachers saw agriculture in relation to crop and livestock production. With one exception, definitions did not include agricultural business, nor were education or research aspects included in any definition.

Importance of Teaching Agricultural Concepts

> Students from all communities and towns across Nebraska have a significant dependence on agriculture and the agricultural industry. Approximately 40 percent of the Nebraska work force are employed in some phase of the production, distribution and processing of agricultural products. This percentage is the highest for any state in the country. Because of this large dependence on agriculture and the tremendous impact of agriculture on the state economy, all citizens have a need to be knowledgeable of agriculture. (Nebraska State Board of Education, 1999, p. 2)

Each of the teachers noted the importance of students understanding concepts associated with agriculture. In addition to being information "everyone should have," Lisa noted the many careers that are involved with agriculture, in which students might be involved in the future: "It would just be personal growth as well as knowledge of knowing. I don't know that we are going to get them to come back to the farm, but they may work with agriculture."

Kate and Christina both noted the importance of learning about agriculture, because of its important to the economy of Nebraska, as Kate states

> If you are going to learn about Nebraska and...the Midwest, you have to include agriculture because that is a big part of their life. And it just seems like that is how I have done...the Nebraska studies; we include a lot of agriculture or talking about the things that we have mentioned, you know. [That] we are a major producer in Nebraska of cattle. And that the soil is not

> the same in the western part of the state as in the eastern part of the state and that there is more grass in the sand hills...that is what Nebraska is. When you start studying about the state of Nebraska you can't leave agriculture out...which is what the state does.

Christina reported a similar need for students to understand the environment in which they live:

> Anytime in their own state and they find out, you know, what is going on...it's important. And it is part of our environment. It is kind of like you joke about...chocolate milk and brown cows from Nebraska. I don't think a lot know that a corn can turn into different foods. They were shocked with the cotton plants, when I made that comment that they turn it into our shirts, like t-shirts.

Dana observed that agricultural literacy is important for students living in rural communities, due to the economic impact of agriculture. At the same time, she firmly noted the importance of all individuals becoming agriculturally literate.

> I think it almost becomes more important [for people in the city to know] because they are not living it, you know. These students [in rural areas] live it and therefore learn a lot because they are from the farm. Whereas someone in the city, I think it becomes even more important because they don't live it. It is not a day to day event for them. And I think it is important for them to know where their food comes from and, you know, some of these things, don't just show up in the grocery store.

Dana continues:

> It has a lot to do with the economy of the state as well as the economy of the nation. One thing about agriculture, you know, the markets are all based upon, or a lot of them are based upon the livestock prices and the crop prices and just the fluency of our, of our nation as a whole. I think people need to understand that when, when the weather is bad or we have drought, and what kind of effect that has as a chain reaction to someone even within something that is not so far-fetched as computer and history. Because it does make a difference and it does have a chain effect. And I think it is important that everybody understands that whether they come from a farm or not.

All of the teacher respondents reported an awareness of the importance of agriculture within the communities in which they reside. They all reported, also, the need for students to understand agricultural crop and livestock production, in particular, and have an awareness of issues impacting agriculture. Regardless, each of the teacher respondents reported outside influences, including pressure to stick to a set curriculum, along with a lack of available time and resources, as reasons they were not integrating more agricultural material into their classroom instruction.

Comfort Level in Teaching Agricultural Concepts

Four of the six teachers, Kate, Lisa, Dana, and Jackie, all indicated a high comfort level with teaching agricultural-based curricula. Both Christina and Ann indicated nervousness with presenting agricultural materials and information.

Kate strongly felt that her high comfort level in presenting agricultural materials and concepts correlated directly to her experiences in agriculture outside of the classroom. She was unsure if other teachers within the school district would have that same comfort level.

> I think I do alright but... I think I have the advantage cause I grew up on a farm and I have lived in an agriculture community. Someone who grew up in Omaha in the city and has not experienced the agricultural, or doesn't have an agricultural background might be a little bit more difficult. Then I would think...it would help to have a curriculum or something to go by.

Kate continues:

> But it is kind of hard for me to say because like I grew up, the way I grew up and living on a farm and whatever. To me, it is easy to incorporate these

> thoughts into my classroom and because of where we live in this community; we are so tied into agriculture. But if I was teaching in Scottsbluff or North Platte, the larger community, a larger city, then I could see it would be more difficult because the kids would not have anything to relate it back to.

Despite living on a working farm during her childhood, Christina was not heavily involved in many of the aspects of the farm. She indicated some hesitation in teaching agricultural concepts, stating that she relies heavily on textbooks for information. "The only agriculture I have ever taught is what is in our science book or what is already there." At the same time, though, she discussed a section in the science curriculum where the students discuss erosion. At this juncture, she led the class into a discussion of terraces and attempted to draw a visual representation for students. She stated that she would feel more comfortable teaching agricultural concepts, "if I have materials that support, you know, what [is] expected."

Each of the teachers indicated a willingness to learn more about and incorporate the concepts into their curriculum, when feasible, as shown by Dana's statement:

> You know, it is like anything. I am willing to do my homework before I start it. You know I think, at this, at this level, I have kind of a handle of what is going on. But there would be different things as far as; I wouldn't want to give them any myths. You know, I want to make sure that I have the correct [information]. And so that is like, to put any curriculum together, I always think that curriculum needs to have, you know, some good research background for the teachers, so that they can read [further].

Teacher respondents were all willing to integrate agricultural material into their classroom instruction, despite various comfort levels. Their levels of comfort correlated directly with their experiences on a working farm. Given the appropriate materials and resources, though, each were willing to integrate agricultural materials.

Nebraska Academic Standards

Schwartz and Robinson (2000) reported that nearly every state either has, or is in the process of adopting, documented academic standards.

> ...academic standards that specify what students are expected to know and be able to do in the core academic subjects at key grade levels; assessments that measure progress against those standards; and accountability systems that, at a minimum, provide annual public reports on school and district performance. (p. 173)

Nebraska is one of those states. At the time of the study, the Nebraska State Board of Education was in the process of documenting and adopting "measurable model academic content standards that cover reading, writing, mathematics, science, social studies and history..." (Nebraska State Board of Education, 2002, p. 3).

Each of the teacher respondents in this study were mindful of changes that had, and would continue to, take place within their curriculum, as they were in the process of aligning their own curriculums with the Nebraska academic standards. These standards were the most common reason cited by the teachers for a reluctance to integrate additional materials. For example, Kate emphasized the already full curriculum at the fourth grade level:

> We are going through a change right now because the state of Nebraska has standards that they have set up things that we are required to teach. At this age [fourth grade] we are, our curriculum is kind of [full] because of state standards now. So, um, what I am teaching now possibly will change for next fall because of the way we want, we want to be able to cover all the standards and not do a lot of overlapping and then ignoring something.

Dana added her concerns, which included mandatory assessments:

> ... I think we are going to have a real struggle with this mandated testing [with the state standards] that they are doing. Because the first thing I heard

> was, oh, we don't [have time for particular topics in] social studies and science because we were to busy doing the reading assessment. Well, now we have got the math assessment, and they are so structured, I think we are taking all the creativity out of teaching. They can try to argue and say we are not, but we are. They are so time consuming and there is too much pressure.

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999) do not align with the *Nebraska L.E.A.R.N.S.* content standards below the 12th grade (Nebraska State Board of Education, 1999). Additionally, there are no plans to expand the alignment of the standards below the 12th grade (L. Bell, personal communication, August 18, 2003).

With the academic standards specified in *Nebraska L.E.A.R.N.S.*, districts are required to submit student assessment to the Nebraska Department of Education for evaluation. There are consequences for school districts in which students do not perform to acceptable levels. There is no such assessment associated with the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

When asked how the fourth-grade curriculum was formed, Jackie stated that there was a curriculum established by the school district: "It is probably more a guide, but it is something that should be covered. It is guided by the state standards; and then teachers are put into groups and we establish our curriculum K-12 based on those standards."

Kate felt that it was essential to have the agricultural concepts integrated directly into the state standards, in order for teachers to utilize them. Lisa also stated that the Nebraska Ag Literacy Concepts "should really be put into a standard for social studies." Ann

recognized this need, also: "If it gets [integrated] with the standards, the things that I am already teaching, I would be interested in doing some of those."

The introduction of the state standards was an overriding concern for each of the teacher respondents. As this introduction was still relatively new, there was a great deal of anxiety for the teachers surrounding the efforts. At the time of the study, teacher respondents were uncertain of what to expect and how it would affect their curricula. Respondents were very clear, though, that any additional instructional materials must align with the state standards, or they would likely not be utilized in the classroom.

Textbooks

Each of the teachers agreed that agricultural information is most likely to be taught in the classroom if it is incorporated into the textbooks.

Christina noted that the textbooks were chosen based on what "we think is most beneficial, that we will be needing for our state standards." All of the teachers, with the exception of Lisa, indicated a strong reliance on textbooks during the transition to the new state academic standards. Kate was aware of the lack of agricultural knowledge within the current textbooks:

> When you look at the textbooks today, especially science textbooks, very little talks about agriculture and food process industry. I am thinking and I know for example in fifth grade they talk about different regions of the United States and they talk about products and so on, but very little is ever touched on about agriculture.

Dana expressed a similar sentiment:

> For instance, we were looking at the rain forest versus the grain farmers versus the livestock, you know in the early days. And it doesn't say much in the textbook and that would help. But you know, everybody wants their piece of the pie and that is where you are going to run into trouble. Um, fourth grade social studies with that Nebraska segment, the curriculum is always lacking and yet you look at this and really wouldn't this be a great place to have a strong emphasis.

Fourth-Grade Students' Responses

Demographic Background

Six fourth-grade students were interviewed, with an equal number of male and female students. The students were purposefully selected, based on the elementary instructor's recommendation of students who would represent a range of experiences. Students were paid $5 for their interview.

Pseudonyms were given for each student. Students will be referred to as Brandy (school A), Jim (school B), Robert (school C), Angie (school D), Adam (school E), and Kelsey (school F) (See Table 3).

Brandy is the only student who lived on a working farm at the time of the study. Robert, Adam, and Kelsey all lived on acreages, while Jim and Angie lived inside city limits.

In addition to living on a working farm, Brandy noted numerous family members who also considered farming as their livelihood. Brandy was involved in daily livestock chores,

though was not involved in the crop production. Robert spoke of an uncle who also lived on an acreage, with hobby livestock (goats and poultry). At the time of data collection, Robert was raising a calf at the neighbor's farm.

Angie and Kelsey visited extended family members who lived on farms. They spent time watching the operations of the farm, but were not involved with the crops or livestock. Adam and Jim have visited friends who live on farms, but spend little time on the farms themselves.

Three of the students were 4-H members at the time of the study. Angie had previously shown a rabbit through 4-H and was involved in a clothing project, but was no longer a member. Kelsey was involved in 4-H clothing and baking projects. Robert was involved in a calf project for 4-H at the time of the study.

All of the students had pets at home, though their involvement with the daily care of the animals varied. Jim, Brandy, Angie, and Robert were all responsible for feeding their pets, along with cleaning cages/pens. Each had been to the veterinarian with at least one pet. Adam and Kelsey were not involved with the care of their pets.

Jim, Brandy, and Robert all indicated that they were very involved with the daily work of the family's garden. Robert was responsible for his own section of the family garden. Angie's family no longer had a garden at the time of the study, but she had been involved with the garden in previous seasons. Adam and Kelsey's families have gardens, though both students indicated that they were only occasionally involved in the care of the garden.

Table 3. Students' demographic information

Name	School	Gender	Home Location	Parents Occupation	Agricultural Experience	Pets	4-H Member
Brandy	A	Female	Working Farm	Father: Farmer Mother: Farmer	Helps with livestock chores at home; Helps with home garden	Cats, dog, fish, calf – helps with care	No
Jim	B	Male	Rural Town	Father: Doctor Mother: Homemaker	Have friends who live on working farms; Helps with home garden	Dogs and cats – helps with care	No
Robert	C	Male	Acreage	Father: Co-owner of Appliance Store Mother: Homemaker	Raises a 4-H calf on neighbor's farm; Uncle raises poultry and goats; Has own garden at home	Cats and calf – helps with care	Yes
Angie	D	Female	Rural Town	Father: Mechanic Mother: Teacher	Visited extended family on working farms; Previously helped with home garden	Cat and rabbit – helps with care	Yes
Adam	E	Male	Acreage	Father: Owner of plumbing business Mother: Teacher	Have friends who live on working farms; Infrequently helps with home garden	Dog	No
Kelsey	F	Female	Acreage	Father: Construction Mother: Telemarketing	Visited extended family on working farms; Infrequently helps with home garden	Dog and cat	Yes

Over half of the students reside outside of town limits, though only one lives on a working farm. As a whole, the students did not have consistent exposure to agriculture. Over half of the students are involved in the daily care of the family pets. Half of the students were involved in the care of the family garden. It is important to consider backgrounds and experiences when examining student views on agriculture.

This study did not attempt to identify where or how the students are acquiring their agricultural knowledge. However, students' discussions indicate that the bulk of their understandings of agricultural issues are learned outside of the classroom. In discussing agricultural knowledge questions, students often pointed out experiences gained through family and friends.

Students Knowledge of Agricultural Literacy Concepts

Frick, et al. (1995) noted the importance of determining the current literacy level of a given population. "If educational initiatives designed to improve America's agricultural literacy are to succeed, a bench mark that verifies the level of agricultural knowledge and perception should be determined" (p. 2). The Nebraska Agricultural Education Curriculum Framework and Content Standards is one educational initiative aimed at improving the level of agricultural literacy, though a benchmark must now be established.

> The term "agriculture" conjures up very different interpretations based upon one's background and experience. [The Nebraska Agricultural Education Curriculum Framework and Content Standards] acknowledges the broad aspects of the food and fiber system including the production of agricultural

> commodities and the businesses that service the farmer and rancher; the processing, marketing and distribution of agricultural products; and the use and conservation of land and water resources. An understanding of basic concepts and knowledge spanning and uniting all of these subjects define the term "agricultural literacy." (Nebraska State Board of Education, 1999, p. 1)

In the previous section, in reporting teacher findings, each of the *Nebraska Agricultural Education Curriculum Framework and Content Standards* were reviewed. The *Nebraska Agricultural Education Curriculum Framework and Content Standards* identifies agricultural topics, which students should be aware of, but does not identify the specific answers. For example, one of the concepts listed states that students should be able to identify agricultural businesses, but does not identify these businesses.

Therefore, it is necessary to establish a point of reference for this study to compare with student views in defining each of the concepts. A very brief overview of the concept specifics, from prior literature, will be presented in reviewing student respondents' understandings on each of the concepts.

Nebraska Agriculture Concept

Within this concept, two specific examples are given for third through fourth grade (Nebraska State Board of Education, 1999, p.3).

1. Explain basic process from producer to consumer.

2. Fun facts that encompass each of the agriculture sectors.

Students' response to questions related to this concept will be reviewed during the Food Science and Technology and Livestock Production Concepts, the sixth concept examined in this section, as the students' responses in these areas were closely related.

Agribusiness/Economics Concept

The second concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Agribusiness/Economic Concept" (Nebraska State Board of Education, 1999, p.3). Within this concept, two specific examples are given for third through fourth grade.

1. Identify agricultural businesses.
2. Field trip to an agriculture business.

This concept is established by the *Nebraska Agricultural Education Curriculum Framework and Content Standards,* as well as under benchmark IV, part A, for fourth- and fifth-grade students in the *Guide to Food and Fiber Systems Literacy* (Leising & Igo, 1998). In addressing the importance of agribusiness on the economy of Nebraska, the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999) calls for students to have the ability to identify agricultural businesses, by the end of the fourth grade. The agricultural literacy concepts outlined in the *Food and Fiber System Literacy Framework* state that, "students will identify people who work in Food and Fiber Systems, during the second and third-grade" (Leising & Igo, 1998, p.

1). Similarly, it states that students "will give examples of agribusiness in the community, through the fourth and fifth-grade" (Leising and Igo, 1998, p. 1). Neither of these documents identifies what qualifies as an agricultural business. Therefore, it is necessary to review prior literature to establish a point of reference for this study to compare with student views in defining agricultural business.

Careers in Agriculture, on the National FFA Website, lists 365 fields of study and employment in agriculture. These fields are broken into six career areas: agricultural and forestry production; communication and education; managers and financial specialists; marketing, merchandising, and sales representatives; scientists, engineers and related specialist; and social service professionals. The following list is not inclusive, but rather provides a sampling of available agricultural career options:

> Account executive, advertising manager, aerial crop duster, agricultural association executive, agricultural chemical dealer, agricultural educator, agricultural equipment dealer, agricultural extension agent, agricultural journalist, agricultural plumber, animal groomer, animal health products representative, animal inspector, beekeeper, biotechnology documentation specialist, butcher, career counselor, cattle rancher, chemical distributor, certified seed grower, computer operator, computer salesperson, dairy farmer, diesel mechanic, dietitian, entomologist, environmental scientist, farm auctioneer, farm broadcaster, farmer, feed mill operator, fire warden, floral shop operator, food broker, food inspector, forest firefighter, forest ranger, fruit distributor, game warden, grain broker, grain buyer, grain farmer, graphic designer, greenskeeper (maintaining golf courses), groundskeeper, insurance agent, landscaper, lawn and garden equipment mechanic, logger, pest control technician, photographer, real estate broker, soil scientist, veterinarian, welder, youth 4-H Leader, zoologist (National FFA Organization, n.d.)

A review of literature did not find a listing of agribusiness examples appropriate for a fourth-grade level. The National FFA Organization list (n.d.) is very specific, pointing to the variety of agricultural career options.

In interviews with each student, students were asked to name agricultural businesses within their local community. Without assistance, students were able to name from three to eight agricultural businesses. The most common responses included insurance (four), grocery (three), banking (three), grain elevator (three), and farming (two). Other responses included farm equipment manufacturer, fertilizer dealer, grain deliverer, hauling grain, mechanic, seed sales, and farm record keeper.

Jim was unclear on specific agricultural jobs, though understood that there were many agricultural jobs. "You could be a grocer, and you can work at (a meat processing plant), be a teacher, a lot of jobs in this region."

Angie listed education as an agricultural business. Similar to Jim, she was very clear on the vast role of agricultural business. "A teacher and like doctors, dentists, and all of it. Almost every job is related to agriculture in some way." Angie also listed grocery stores, mechanics, farm equipment manufacturing, construction, fertilizer and feed sales, and insurance as agricultural careers.

> (Insurance agents) help the farmers with their insurance and like if they have a bad year or maybe when they fell off the tractor, then their insurance would cover it. (A bad year is) like this year we didn't have much rain, we just had a lot of snow and then that one time we had kind of a floodish rain.

Brandy also identified insurance agents as being a part of agricultural business. She states the importance of this business: "If there was a really bad year and the crops were all wiped out, you wouldn't make anything and [an insurance agent] would give you some of the money."

Adam and Brandy both identified farming as an agricultural business. Adam understood that there were "a lot of farmers" in the community, but had a difficult time naming an agricultural business or career options. He stated that bankers and grocers were not agricultural careers. Adam identified raising "show cattle" as a possible agricultural career.

Kelsey was unable to identify, even with prompting, a local agricultural seed company. The company is prominent in the community, employing seasonal and year-round employees from the community. Additionally, the company buildings are easily seen from within the city limits. When told the name of the company, Kelsey recognized the name, but was unable to identify what product was produced there (certified grain seed).

Jim was able to identify two major employers in the community (meat processing plants) with prompting. He did list historical museums as an agricultural business:

> Because it might have things from a long time ago in your state and might have found some things while you were digging up in the ground...And they probably have some old Indian things that could probably help people look more into our states...(tools like) hoes, um, shovels, rakes, tractors and plows.

Student respondents were able to name between two to six agricultural businesses without prompting. With prompting, three students were able to name two additional agricultural businesses.

Conservation/Environmental Concept

Though there are three specific examples listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* for "Conservation/Environmental Concept" (Nebraska Board of Education, 1999, p.3), the student respondents were unable to provide meaningful findings in this area. The students lacked the basic vocabulary necessary to answer questions pertaining to this concept.

Agricultural Exports and Imports

Students were also asked to identify food products that are purchased from other countries (imports), along with food products sold to other countries (exports). This is not a concept specified by the *Nebraska Agricultural Education Curriculum Framework and Content Standards.* It is, however, a benchmark outlined in the *Guide to Food and Fiber Systems Literacy,* under benchmark IV, part D, for second- and third-grade students (Leising & Igo, 1998).

A Guide to Food and Fiber Systems Literacy states that students, in the second and third grade, "will define import and export. They will identify U.S. food and fiber products exported to other countries" (Leising & Igo, 1998, p. 10). During the fourth- and fifth-grade years, the guide states "students will explain why nations trade products and services. They will make a list of agricultural services the U.S. trades with other nations" (Leising & Igo, 1998, p. 10). The *Guide to Food and Fiber Systems Literacy* does not identify what qualifies as countries which Nebraska or the United States imports from and exports to, or the products that are imported or exported. Therefore, it is necessary to review prior literature to establish a point of reference for this study to compare with student views in defining agricultural business.

Nebraska exports goods globally to 143 foreign destinations. The state's leading market is Japan, with 32% of the exports in the year 2000. Canada has 17% of the exports, South Korea with 9%, and Mexico with 6%. Other leading markets are Taiwan, Italy, the Netherlands, and the Philippines. The top five agricultural exports from the State of Nebraska are feed grains and products, live animals and meat (excluding poultry), soybeans and products, hides and skins, and feeds and fodders (International Trade Administration, n.d.).

Additionally, the American Farm Bureau (2001) lists beef/veal, cotton, feed and fodder, feed grains, fruits and vegetables, hides and skins, live animals, poultry, soybeans, tobacco, and wheat as top U.S. agricultural exports.

All of the student respondents had a difficult time understanding the terms "export" and "import." It is unclear if students had not heard these terms previously or if they had simply not employed the terms regularly in classroom discussions. Before student respondents were able to list agricultural imports or exports, it was necessary for the correct definition to be presented.

When asked which countries purchase food or agricultural products from the United States, Robert answered, "Countries that don't have much food, like a desert." More specifically, he stated Afghanistan, due to poor soil and a lack of available food. He was unaware of any specific agricultural products that might be exported. It is worth noting the current events happening at the time of the interviews, in April 2001. It is possible that Robert was more aware of Afghanistan, due to increased media coverage at the time of the study.

Brandy could not name any countries that the United States trades with, though she thought that sugar was exported. "Like the sugar, out in western Nebraska. They make sugar and that is shipped to places." Sugar beets are a crop raised in western areas of Nebraska, though Brandy was unaware from which agricultural crop the sugar was produced. Brandy cited the favorable climate in western Nebraska as a reason for exporting sugar. Favorable climate was a common theme among the students, as reasons for other countries to import agricultural products.

Jim stated that Canada and Mexico purchase beef, wheat, and vegetables from the United States. "In Canada, it has a really cold climate and it is hard to plant crops and raise animals there. In Mexico, it is too hot and dry."

Kelsey stated similar rationale for reasons the United States exports products. "Some places, if they are hot or live by the equator, they can't [grow] corn because it is too hot for the corn to grow there. So they might want to buy some corn or other stuff from Nebraska or the United States." She stated Alaska as a country that might purchase agricultural products from the United States.

Adam listed desert countries in Africa as importing food from the United States, "because they can't grow it there." He listed bread, corn, eggs, and milk as products being exported to African countries. Angie also listed Africa as a country to which the United States exports food products. "Africa or Asia purchases...corn from Nebraska and Iowa because if they had like a bad year and we might have a good year so they might need some corn."

The American Farm Bureau (2001) lists bananas, beef and veal, cocoa, coffee and tea, dairy, fruits and vegetables, grain and feed, and spices as top U.S. agricultural imports.

> While exports generate clear benefits for the Nebraska economy, the role of imports is less clear, since no import statistics are available for states on an end-user basis. Imports ensure supplies of a vital material that are either scarce or simply not available domestically. Imports also provide consumers and businesses in Nebraska with a wider choice in the marketplace (U.S. Department of Commerce, 2001, p. 4).

Angie was unaware of specific agricultural products or foods that the United States purchases from other countries, though she was aware that the United States does make these imports. "We might need more of something; maybe we didn't have enough bread if we didn't have a great year, then we might need some more." She volunteered toys as non-agricultural imports from Japan and China. Angie also discussed how one country, such as

Japan, might be able to grow a specific crop and trade with the United States. She identified corn as a potential product Japan might trade, while the United States might trade wheat for the corn. Angie saw this as an economic savings for both countries.

Robert also noted that the United States trades with other countries, "because they might need some of ours and we might need some of theirs." He could not name any countries, other than Afghanistan, that the United States trades with, but saw a need for trade when "we don't have some stuff that they have."

Brandy listed spices and "tacos from Mexico" as product imported to the United States. She did not believe the United States imported beef from other countries, "because we have a lot." Brandy lives in a county that produces the highest number head of beef in the state of Nebraska. Her parents also raise commercial beef.

Adam also believed that beef is not imported by the United States. Adam listed bananas, lemons, and oranges as being purchased from Brazil, due to their tropical climate with "more sunshine".

Jim, who lives within the same county as Brandy, stated that Nebraskans import beef from Africa, "because we run out of livestock."

Kelsey stated that the United States purchases meat and vegetables that are unable to be grown within the country from other countries. She was not sure of which countries would export these to the United States: "Another country might have some animals that (Nebraskan's) don't have, because our environment isn't good for that animal, but we still like that meat." She also stated that beef from other countries might taste different.

Japan is the state's leading export market, though none of the students named Japan as a country that Nebraska exports to. One student listed Canada and Mexico as countries to which agricultural products are exported. Both of these countries are among Nebraska's top four export markets. Four student respondents listed grain, which are imported, while one listed livestock.

Only one student respondent identified a grain as an agricultural product which Nebraska imports, while two students identified livestock. Other products identified by only one student include bananas, spices, and vegetables. The American Farm Bureau (2001) lists bananas, beef, vegetables, grain, and spices among the top U.S. agricultural imports, each of which was noted by student respondents.

Crop Production Concept

The fourth concept area listed in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* is "Crop Production Concept" (Nebraska State Board of Education, 1999, p.4). Within this concept, three specific examples are given for third through fourth grade.

1. Identify local crops grown in Nebraska.
2. The importance of water and its origination.
3. The effect of climate on crops, both positive and negative.

To determine understandings of this concept, students were asked to identify local crops grown in Nebraska. In the *Guide to Food and Fiber Systems Literacy,* benchmark I,

part C, for fourth- and fifth-grade students states that, "students will identify major agricultural commodities produced in their state..." (Leising & Igo, 1998, p. 1).

Neither the *Nebraska Agricultural Education Curriculum Framework and Content Standards* nor the *Guide to Food and Fiber Systems Literacy* identifies local crops grown in Nebraska. Therefore, it is necessary to review prior literature to establish a point of reference for this study to compare with student views in defining local crops grown.

Corn, soybeans, winter wheat, and sorghum are the state's leading crops, with approximately 15.5 million acres of cropland. Corn and winter wheat are grown essentially statewide, while most soybeans are produced in the eastern one-half of Nebraska. Primary sorghum producing counties lie in the southeastern one-third of the state. Specialty crops of dry edible beans and sugar beets are produced in western Nebraska (Nebraska Agricultural Statistics Service, 2001).

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999) states that students should identify local crops grown in Nebraska (p. 4). The top five crops grown in Nebraska are: corn, soybeans, sorghum, wheat, and hay. Dry edible beans and sugar beets are also produced in high numbers, primarily in western Nebraska. *A Guide to Food and Fiber Systems Literacy* states that students, in the fourth- and fifth-grade years, "will identify major agricultural commodities produced in their state" (Leising and Igo, 1998, p. 10).

Each of the students identified corn as a crop grown in Nebraska. Angie listed corn and soybeans as crops grown in Nebraska. She then utilized her experiences with home

garden: "sunflowers, also, because we have had sunflowers in our garden once. Strawberries are not a crop, but sometimes strawberries." She listed beans and soybeans as separate crops, noting "six or seven" different kinds of beans are grown in Nebraska: "[Some types of beans are] soybeans, regular beans, potted beans, string beans, and lima beans."

Similar to Angie, Kelsey listed corn and soybeans, along with products she had previously identified as having grown in her home garden: beans, lettuce, and broccoli.

Robert identified "corn and beans and alfalfa mostly" as crops grown in Nebraska. He listed wheat and oats as crops raised in western Nebraska, while stating that cotton was a crop raised in other states, "because of weather, it doesn't grow good in our weather."

Similar to Robert, Jim also listed corn, wheat, and cotton as crops grown in Nebraska, while he also identified potatoes. He was unsure where, specifically, in Nebraska cotton is grown, but remembered seeing cotton listed on a map during a Social Studies lesson. Adam also listed soybeans, corn and cotton, in addition to sorghum. Adam was unsure of crops grown in western Nebraska.

Brandy was able to identify four of the top five grain crops grown in Nebraska: corn, [soy]beans, [alfalfa] hay, and wheat. When discussing products exported, she noted that sugar was produced in western Nebraska, though was unaware of what crop the sugar was produced from.

Corn, soybeans, winter wheat, sorghum, [alfalfa] hay, dry edible beans, and sugar beets are the top seven crops produced in the State of Nebraska. Each of the students listed corn as a crop produced in Nebraska, while five of the six students listed soybeans. Wheat was listed by three of the students, though there was no differentiation of winter versus

summer wheat. Two students listed beans, though they could not define them as dry edible beans.

Food Science and Technology Concept

Within this concept, three specific examples are given for third through fourth grade (Nebraska State Board of Education, 1999, p.3).

1. How does grain become food?
2. Is our food safe to eat?
3. The food chain.

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999) also calls for students to have the ability to explain the basic process from producer to consumer, as stated under the Nebraska Agriculture Concepts, as well as to identify how grain becomes food, by the end of the fourth grade. The *Guide to Food and Fiber Systems Literacy* states that in the second and third grade, "Students will describe the journey of an agricultural product from the farm to the consumer. They will label the sequence of steps a food or fiber product takes from production, processing, marketing, and distribution to the consumer" (Leising & Igo, 1998, p.1).

Neither the *Nebraska Agricultural Education Curriculum Framework and Content Standards* nor the *Guide to Food and Fiber Systems Literacy* identifies the specific journey

from producer to consumer. Therefore, it is necessary to review prior literature to establish a point of reference for this study to compare with student views on the specific journey from producer to consumer.

Almost all purchased food has been processed in some form or other. The processing of food means to prepare the raw product into a product in which it can more easily be preserved, stored, distributed, sold, and consumed. For example, the *North Dakota AgMag* describes six steps in the journey wheat takes, from the field to the consumer (Wheat distribution, 1999, p.3):

1. Farmer produces wheat.
2. Farmer delivers wheat to elevator.
3. Elevator sells wheat to mill or to a foreign country.
4. Mill bags flour to sell at grocery store or sells flour or semolina to bakery or pasta manufacturer.
5. Bakery or pasta manufacturer packages products to sell at grocery store.
6. You buy wheat foods at the grocery store.

Angie was able to identify wheat as the grain in most bread, stating that the portion used for flour was the seed. She understood that dough was necessary in making bread, but was unclear how the wheat was produced into dough. "You grind up the wheat and you probably make it so it would be soft. You would pour some in and then you would have to roll it and roll it up to make it thick."

Robert agreed that bread was made from the seeds of wheat. He stated that at the processing plant, the wheat would be processed into flour: "You grind it, then you have got to clean it and stuff." He was unsure of any other steps in the process.

Brandy identified wheat as the grain in bread: "You take it to a mill... they send it through like a machine or whatever to clean, take all the dirt and stuff out of it... Then they

have to add like yeast and water or whatever and then they put it into the oven and then they have to pack it and ship it to the store."

Jim stated that wheat is used to make bread. "They take all the little seeds off the wheat and then mash it up, put into a bowl and stir it up and then it will be just like powder. I think they bag it up and bring it to the store, to the truck." He was unsure of how the flour was used to prepare bread.

Kelsey was able to identify steps in processing wheat into flour, but not how bread is prepared. "Um, well like I think that you take, you take all your wheat and stuff and you take it to the grain mill and then they grind it up and smash it, they probably put in other stuff and then it turns powdery into flour." Brandy noted the role of a grain mill and also mentioned that there are a variety of brands available:

> Well, if the people that get the grain and stuff...they might take some off, then take it to a mill and then the mill will sell wheat as flour. Oh, different brands probably have like a manufacturing place where they make the bread and different stores will buy it. So we might buy Pillsbury, and all brands. They buy it from different places.

Adam was also able to identify wheat, as the grain from which bread is produced, but was not able to provide details on the process: "When you get it, it gets grinded up, then it gets mixed with yeast and other things. Mix in water and then bake it and it turns into bread."

None of the students were able to identify any other grains that could be used to manufacture flour, nor were they able to name other products produced from wheat. Five of

the student respondents noted that the wheat must be ground, while two noted that the wheat must be cleaned. Three students referred to the need to package the final product.

Livestock Production Concepts

Within this final concept, three specific examples are given for third through fourth grade (Nebraska State Board of Education, 1999, p.3).

1. Understand the process of meat getting to the dinner table.
2. Identify groups of livestock and their names, e.g. litter, herd, flock.
3. Nebraska history and rank.

In addressing the concept of agricultural processing, the N*ebraska Agricultural Education Curriculum Framework and Content Standards*, (Nebraska State Board of Education, 1999) calls for students to have the ability to explain basic process from producer to consumer, as well as to understand the process of meat getting to the dinner table, by the end of the fourth grade.

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* does not identify the specific journey livestock takes from producer to consumer. Therefore, it is necessary to review prior literature to establish a point of reference for this study to compare with student views in the specific journey from producer to consumer.

All About Beef, produced by the Nebraska Beef Council (n.d.), lists several steps in the journey of beef cattle from the farm to the consumer, in the section titled "Beef: From Farm to Table":

> After the calf is born at 80-90 pounds and later weaned from the mother, the cattle are sold at an auction market or sale barn or they may be purchased directly by the feedlot. At one year of age, the calf will weigh approximately 800 pounds and will go to a feedlot. Here the calf will continue to grow, until reaching approximately 1200 pounds. At this point, the cattle move to a processing plant, where they are slaughtered and then chilled to preserve the quality of the meat. Some are kept as whole carcasses and shipped to the butcher to make the cuts of meat that are displayed on the supermarket shelf. Meat that is left over from trimming, or which does not make a complete cut, is turned into other products such as hamburger, sausages, and hot dogs. (Nebraska Beef Council, n.d., p. 3-4)

Meat is transported in refrigerated trucks from the processing plant to a retailer, such as a butcher shop or grocery story, or to a wholesaler who then sells it to retailers or restaurants. *All About Beef* also discusses the by-products that come from beef:

> Parts of the animal are not edible, meaning that humans cannot eat them. These include the bone, fat, hide, and others. They are used to make by-products such as glue, fertilizer, baseball gloves, football gloves, footballs, crayons, soap, cosmetics, medicines, and many others (Nebraska Beef Council, n.d., p. 4).

Brandy listed meat and sausage as food products from "pigs and cows." She was also aware that hamburger came from cattle, but unaware of any other by-products cattle are used for:

> Well they take it to the stockyard. They sell it to the big companies, or sometimes you just haul it to [a meat packer]. And then they butcher the cow and they clean like all the meat and stuff and then they pack it, like patty it and put it into packets.

Angie was also aware that hamburger was produced from cows. She discussed butchering beef with her grandfather, while listing sports balls and fur as by-products from livestock:

> We never get to really see it, because kids are not supposed to see it. [Kids] are not supposed to be back there, but [the adults] shoot the cow. We have like these big freezers and they hang [the cows] by their back legs. There are eight to nine cows that we kill at one time and there are only a few people working. My grandpa who does the head and then my mom will like cut it. Then my grandpa has this little chain and he cut some of it off - trim off the fat - and then my Uncle Mark will cut it into slices. Then we have one thing that we put the meat in there and it kind of shreds it all up. [Another machine] makes it go into the packages and then we put like a little seal over it.

Robert was also able to describe the production processes. "You take [the cattle] to get slaughtered. Then, they cut it all up and they take the meat part and they freeze it and package it and then send it and they cook it." Robert stated that "science experiments" are what the livestock are used for, after the meat is processed. He also stated that they make glue out of the bones "And the skin could be like, they can make something soft out of them."

Jim described the process as beginning when "[a cow] gets brought from the truck to, butcher places. Then they chop it up and then they bring it to grocery stores." He stated that the grocery store cuts up and packages the meat.

Kelsey stated, "You have to process it [at the butcher shop], clean it out to make sure it does not have bad meat or something. They make meat out of [the cow] at the butcher shop and so then the people buy the meat or they could sell it and then it keeps going on and on." She listed leather as a cattle by-product, noting that it is produced from the hide. She

was unaware of any other products that might come from cattle, but listed the bones and head as parts of the cow that are thrown out.

Adam described the process, beginning with loading the cattle at the farm. "Well, they get them on a trailer and then they take them to IBP [processing plant], then they slaughter them and prepare them like make them into beef and stuff. Then they bring it to McDonald's." Adam also stated that the by-products of the livestock were thrown-out.

Each of the students noted that the animal is killed, with three students citing the word "butcher" and two students citing the word "slaughter." One student also cited the name of the slaughterhouse. Each of the students also referenced the end of the journey, noting that the meat was packaged, taken to McDonald's, or sold to consumers. Student respondents were generally unable to describe the by-products of livestock in detail. One student was unsure of any by-products, while another stated that the by-products are "thrown out."

Definition of Agriculture

The *Nebraska Agricultural Education Curriculum Framework and Content Standards* does not establish a formal definition of agriculture. Correspondingly, as previously discussed, a review of literature recognizes numerous accepted definitions. The students were asked to present their definition of agriculture.

Angie, Robert, Kelsey, and Adam all cited very traditional definitions of agriculture, focusing on the production of crops and livestock. Angie, in her definition, noted specific

crops that are grown, citing that agriculture is "farming, like corn… I think of like beans and corn and silage." Robert gave a similar definition, stating that agriculture is "growing different crops of all kinds." When encouraged, Robert included livestock in his definition.

Kelsey defined agriculture as "farming," adding "taking care of animals" when prompted. Likewise, Adam stated that agriculture was "farming and planting and taking care of animals."

Jim's definition was broader, stating that agriculture was "the buildings and or the outdoors and the wildlife there…the people, the businesses."

The student respondents' generally traditional definitions, focusing on crop and livestock production, were similar to the definitions provided by the teacher respondents.

CHAPTER V: Summary of Findings and Implications

Chapter five will be divided into two sections, beginning with a summary of findings, followed by a section detailing the implications for student learning and teacher instruction, including recommendations for future research.

Summary of Findings

Research Objective 1: Explore teachers and students' backgrounds and experiences, relative to agricultural literacy knowledge.

In this study, the teacher and student participants were from rural areas in Nebraska. Agriculture plays a strong economic role within each of the communities in which the teacher and student respondents reside. This fact, alone, leads to a false sense of security with respect to assumptions about agricultural knowledge. Each of the six teachers, at some point in the interviews, referred to the fact that their students learn agricultural knowledge simply because they live in an agricultural area. A majority of the students, however, reported little experience with production agriculture. At the time of the study, only one student lived on a working farm, while three of the students lived on acreages. Even those students who reported visiting farms had little knowledge of what happens on those farms.

Teachers and students alike had limited definitions of agriculture, focusing on crop and livestock production. Additionally, students had a difficult time identifying agricultural business within their communities. Meischen (2002) found similar results, stating

> Agricultural educators can no longer assume that rural students have been directly exposed to farming practices. Although these students live in small, rural towns, there is an increasing possibility that the students have no direct access or relation to the surrounding agriculture enterprises. (p. 81)

Teachers assumed students were gaining their agricultural knowledge from outside of the classroom, primarily due to the fact that they live in communities with an economy based on agriculture. This study confirms that the bulk of the student respondents' understandings of agricultural issues are learned outside of the classroom. This finding correlates with those of Trexler (1999), who stated, "that experiences outside of school were the strongest determinant of agri-food system literacy (p. 217)... Findings indicate that parents and grandparents were instrumental in providing younger children with knowledge that was integrated into their schemata" (p. 218).

Research Objective 2: Determine how Nebraska fourth-grade elementary students' understandings of agriculture, or agricultural literacy, compare to goal standards outlined by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

This study verifies that the student respondents do not have the agricultural knowledge necessary to indicate proficiency along the standards indicated by the *Nebraska*

Agricultural Education Curriculum Framework and Content Standards (Nebraska State Board of Education, 1999). This study did not seek to determine what students know, overall, about agriculture. Rather, it looked only at whether the students in the study possess a slice of the agricultural knowledge suggested by the *Nebraska Agricultural Education Curriculum Framework and Content Standards.*

This study found that the students have acquired a basic grasp of portions of each of the agricultural concepts, yet the entire concept remains elusive in the students' articulation of their knowledge. They are not misinformed on agricultural issues; rather, they seem under informed, and tend to present only partial information. For instance, students understood that livestock are butchered and eventually taken to a restaurant or grocery store. Describing the whole process was a difficult task for five of the six students, who were very unsure of their answers. The results from this study of rural students within Nebraska's ESU #2 were similar to those of Trexler (1999) and Meischen's (2002) research on agricultural knowledge of elementary students, which indicate that students posses an incomplete picture of agricultural processes and issues.

With respect to agriculture-related businesses, students in this study were all able to name agricultural businesses, ranging in number from three to eight businesses or types of businesses, though it was a difficult question for the majority of the students. Their awareness of these businesses were primarily based on experiences they had outside of the classroom.

In terms of international trade, four students were able to name at least one country in which Nebraska exports or imports agricultural products with. One student listed "Alaska" as a country, while another listed "Africa". Students were very unclear, though, on the importance exports and imports play in Nebraska's economy, nor were they clear on the reasons for trade.

Even with prompting, students had a difficult time describing the steps by which wheat and beef are processed for human consumption. Students also had a difficult time listing agricultural by-products. Ironically, this is one area in which the teachers felt that their students would be able to accurately explain based on their experiences within the home and the rural community.

One student was able to name five of the seven leading crops produced in Nebraska, while the other five students named between two and four of the leading crops. Similar to the teachers, the students' definitions of agriculture were limited, focusing primarily on livestock and crop production agriculture. This is a reasonable definition, given the fact that the communities in which each of the student respondents reside are centered around production agriculture. This finding, though, accentuates the need for agricultural education within the classroom, as the students' experiences outside of the classroom may lead them to a limited definition of agriculture. A more complete integration of agriculture into the elementary curriculum may help expand the definition of agriculture, for a more complete understanding of food and natural resources, including agricultural processing and distribution, economic issues, political issues effecting agriculture, as well as the effects of agriculture on the environment. Table 4 provides a summary of students' responses.

Table 4. Agricultural concepts integrated into the fourth grade curriculum, as noted by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

Agricultural Concepts and Knowledge	Brandy	Jim	Robert	Angie	Adam	Kelsey
Identify agricul-tural businesses	Able to name 2 without prompt; 2 with prompt	Able to name 5 without prompt	Able to name 3 without prompt; 2 with prompt	Able to name 6 without prompt	Able to name 2 without prompt; 2 with prompt	Able to name 4 without prompt
List countries Nebraska exports to, along with products	Unsure; sugar	Canada, Mexico; beef, wheat, vegetables	Desert areas, including Afghani-stan; food	Asia, Africa; corn	Africa; bread, corn, eggs, milk	Alaska; corn
List countries Nebraska imports from, along with products	Mexico; spices, tacos	Africa; beef	Unsure	Japan, China; toys, corn	Brazil; bananas, lemons, oranges	Unsure; meat, vegetable
Identify local crops grown in Nebraska	Corn, beans, hay, wheat, sugar	Corn, wheat, cotton, potatoes	Corn, beans, alfalfa, wheat, oats	Corn, soybeans, vegetable beans, sunflowers, straw-berries	Corn, soybeans, cotton, sorghum	Corn, soybeans, lettuce, broccoli
List steps showing how wheat becomes bread	Clean wheat, add yeast and water, bake, package, ship	(To make flour) take wheat seeds, mash, stir into a powder, bag it and bring to the store	Grind wheat, clean it	Grind wheat, roll dough, package it	(To make flour) grind wheat, put in other stuff	Grind wheat, mix with yeast and other things, mix in water, and bake

Table 4. (continued)

Agricultural Concepts and Knowledge	Brandy	Jim	Robert	Angie	Adam	Kelsey
Identify primary grain used in bread	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat
List steps showing process of beef, from producer to table	Take it to stockyard or meat packer, butcher, clean the meat, package	Trucked to butcher shop, cut up, and brought to grocery store, where it is cut & packaged	Slaughter it, cut it up & take meat apart, freeze, package, and send	Shoot the animal, hang by the back legs, cut it up, trim fat, slice, package, and seal it	Taken in a trailer to IBP, slaughter, prepared into beef, brought to McDonald 's	At butcher shop, it is cleaned and made into meat, sold to people
List by-products of livestock	Meat and sausage	Unsure	Science experi-ments, glue, use skin	Sports balls and fur	By-products thrown out	Leather
Define Agriculture	Unsure	"The buildings and or the outdoors and the wildlife there…the people, the businesses "	"Growing different kinds of all crops"	"Farming, like corn…I think of like beans and corn and silage"	"Farming and planting and taking care of animals"	"Farming …taking care of animals"

Research Objective 3: Determine extent of integration of agricultural concepts into the academic curriculum.

Teachers were asked whether they believed that their students were aware of the information outlined in the *Nebraska Agricultural Education Curriculum Framework and Content Standards*. Overwhelmingly, the teachers believed that the students knew most of the information. However, as discussed previously, they assumed that the students were learning the information at home or within the community – outside of the classroom.

Students are receiving agricultural exposure simply by residing in a rural community whose economy is based on agriculture. This exposure, though, has not provided students with an accurate or complete representation of agriculture, at least as codified in the state standards.

However, teachers who participated in this study questioned whether they have accurate and appropriate curriculum resources with which to convey this information. In this study, only two of the students had significant exposure to agricultural livestock and crop production at home, beyond working in home gardens and with pets. Teachers appear to be the primary individuals who introduce this material to their students, but information about the concepts may not be readily available to teachers. For example, thought the *Nebraska Agricultural Education Curriculum Framework and Content Standards* offer specific examples of the concepts, no accepted answers are provided.

The Nebraska State Board of Education approved and published academic standards in four core areas in 1998 – math, readings, science, and social studies. Teachers in this study were clearly uncertain about how these standards would affect their curriculum and

were relying heavily on existing textbooks until they were more confident of what was expected of them. However, the teachers involved in this study were unaware of the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). Furthermore, the *Nebraska Agricultural Education Curriculum Framework and Content Standards* do not align with the *Nebraska L.E.A.R.N.S.* content standards below the 12th grade (Nebraska State Board of Education, 1999).

The Nebraska State Board of Education (1999) provides that "instruction about agriculture should be integrated into daily instructional programs of math, science, social studies, art, writing, reading, etc." (p. 2). However, findings indicate that teachers noted the integration of agriculture into only the social studies and science curricula areas, not the other academic areas, such as math, art, writing, and reading.

Terry, Herring, and Larke (1992) also found that the "resource most used by fourth-grade teachers in Texas for teaching about agriculture were chapters related to agriculture in textbooks" (p. 58). Teachers participating in this study indicated that the textbooks included little agricultural material.

The teachers all noted that agricultural materials were presented, primarily, in the social studies curriculum, more specifically during the Nebraska history unit. Though there were few instances of agricultural material in the science curriculum, this is likely due, in part, to the fact that state standards call for earth science to be taught during the fourth-grade year. Teachers had a difficult time recognizing how agricultural concepts could be taught through the earth science units or through other academic areas.

This study did not seek to determine the agricultural knowledge of the elementary teachers, but instead to explore whether or to what extent they were teaching the agricultural topics as set forth by the *Nebraska Agricultural Education Curriculum Framework and Content Standards*. This study looked at 16 of the agriculture concepts outline by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). The six teachers involved in the study integrated an average of 7.17, or 45%, of the 16 concepts into their curriculum. This includes materials that teachers acknowledged they "touch on" or "include if time permits." These responses indicate that the material does not have a firm place in the curriculum. Table 5 contains data concerning the integration of the 16 agricultural concepts by teacher.

This study did not seek to inquire about the teachers' perceptions of the effectiveness of existing agricultural literacy material and resources. Discussion with teachers on increased integration of agricultural materials focused on teachers' willingness or ability to integrate. All teachers were aware that teaching materials and resources were available to assist in delivering agricultural material to their students, and five of the six teachers had utilized at least one outside resource.

Teachers generally utilized printed material once and were now unaware of current materials or resources available. One teacher continued to use materials yearly, and had continued photocopying the original printed materials, now potentially outdated. Three of the teachers recalled being contacted by an individual from the Ag in the Classroom program or receiving information from them. Each of the three reported being contacted only once. This underscores the need for extended follow-up.

Table 5. Agricultural concepts integrated into the fourth-grade curriculum, noted by teachers

Nebraska Agricultural Concepts, as stated in the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999)	Lisa	Christina	Kate	Jackie	Dana	Ann
Explain basic process from producer to consumer.	X	X	X			
Fun facts that encompass each of the agriculture sectors.	X					
Identify agricultural businesses.	X		X			
Field trip to an agriculture business.						
Identify Nebraska threatened and endangered species.	X		X			X
Importance of planting trees.	X	X	X	X	X	X
Cause and effects of pollution.	X			X		X
Identify local crops grown in Nebraska.	X	X	X			X
The importance of water and its origination.	X			X		X
The effect of climate on crops, both positive and negative.	X			X	X	X
How does grain become food?	X	X	X			
Is our food safe to eat?	X		X		X	
The food chain.						X
Understand the process of meat getting to the dinner table.	X		X			X
Identify groups of livestock and their names, e.g. litter, herd, flock.	X					X
Nebraska history and rank.	X		X			
Total number of concepts integrated	14	4	9	4	3	9
Percentage of concepts integrated	88	25	56	25	19	56

Each of the teachers also identified perceived outside factors that affected their ability to integrate agricultural materials. Lisa reported the most flexibility within her curriculum, and she clearly utilized more outside resources (six) than the other teachers in the study. Lisa

has also spent the majority of her life on a working farm. Each of these factors likely contributed to the increased number of concepts covered in her curriculum. By comparison, Jackie, who also has a strong agricultural background, reported a lack of flexibility in the curriculum, along with intense pressure related to the Nebraska State Standards. She had also recently changed grade levels. These were likely contributing factors in the lower number of concepts (4) integrated. While each of the teachers noted the importance of students understanding concepts associated with agriculture, they expressed hesitation in the integration of agricultural materials, due to time constraints and curriculum uncertainties related to standards and level of teacher autonomy.

All school districts in Nebraska evaluate student writing proficiency based on the *Nebraska L.E.A.R.N.S.* content standards during grades 4, 8, and 11. In standards other than writing, each district is to determine its own assessment plan, which is submitted to the Nebraska Department of Education. Each of teachers involved in this study currently taught at the fourth-grade level and indicated that they were being tested on writing, science, and math. This fact, along with their feelings of decreased flexibility within their curriculum, increased the amount of pressure felt by the teachers.

Four of the six teachers indicated a high comfort level with teaching agricultural based curricula. Each of the four stated that the agricultural knowledge they possess comes predominantly from their childhood upbringing, versus classroom or workshop learning. This fact likely explains the teacher respondents' assumption that students are also learning agricultural knowledge outside of the classroom.

Implications

As fewer individuals, including students and current teachers, have direct involvement in the agricultural industry, the task of educating the public about agriculture and agricultural knowledge becomes more daunting. Based on the results of this study, it should not be assumed that students who live in rural areas have knowledge of agricultural practices and issues, at least to the level currently stipulated by Nebraska's State Standards. While it is easy to assume that students in rural areas have an accurate and complete understanding of agriculture because they are immersed in it, this proved to be an inaccurate assumption.

Educators should consider the changing landscape of rural communities and examine their assumption regarding shared, tacit knowledge about agriculture when designing curriculum.

Similarly, it cannot be assumed that teachers will have the background knowledge to present agricultural materials effectively to students. To feel comfortable in presenting agricultural material, teachers must have sufficient background knowledge or risk providing students with misinformation. Teachers should be deliberately equipped to address the challenge set by the National Research Council which states that "beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture" (1988, p. 2).

Based on the results of this study, students do not possess the specific types and levels of agricultural knowledge stipulated by the *Nebraska Agricultural Education*

Curriculum Framework and Content Standards (Nebraska State Board of Education, 1999). While this study considered only a subset of the agricultural concepts identified, the findings illustrate that students have not mastered the selected agricultural information.

On the other hand, students did not demonstrate misconceptions on agricultural knowledge and issues. Instead, they possess a limited understanding of the concepts. Trexler (1999), in his study of elementary students' agricultural knowledge, notes the positive aspect of students having incomplete agricultural knowledge rather than possessing misconceptions on agricultural issues: "Time-consuming educational interventions designed to reconstruct misconceptions can be kept to minimum, because the schemata are not burdened with misconceptions, rather the accurate conceptions are simply not present" (p. 217).

The need for a population that is agriculturally literate is well documented (Frick, Kahler & Miller, 1991; Jansen, 2002; Meunier, Talbert, & Latour, 2002; National Research Council, 1988; Nebraska State Board of Education, 1999; Williams & White, 1992). Because students are the future consumers, legislators, and voters, agricultural educators must continue the effort to increase the agricultural literacy of elementary students. This effort begins with those educators who work directly with these students on a daily basis, and this study illustrates that there is room for improvement.

This study indicated that the 16 selected agriculture concepts do not occupy a predominant place within the curriculum. The positioning of agricultural knowledge at the margins of the elementary curriculum is unlikely to result in strong knowledge gains.

Currently, there are no content standards that are aligned with the Nebraska academic standards below the 12th grade, with no plans to expand this alignment. Additionally, the teachers involved in the study were unaware of the *Nebraska Agricultural Education Curriculum Framework and Content Standards.* Teachers must be made aware of the *Nebraska Agricultural Education Curriculum Framework and Content Standards* before they can align their curriculum to these standards. However, given time constraints and increased pressure on academic standards, teachers are unlikely to introduce agricultural material without strong motivation.

Promoters of agricultural education must work to increase teacher motivation, including aligning agricultural lessons and content standards with the current academic standards. The end users, namely elementary teachers and students, must be included in this process.

Increased energy must also be placed on agricultural literacy efforts, such as Ag in the Classroom and Project WET and Project WILD. Three of the teachers had participated in these formal workshops. These teachers experienced no follow-up, however, and the instruction was not sustained in their classrooms. One-shot approaches are not effective, since they represent inadequate opportunities for teachers to learn new material and for students to acquire the new information. Additionally, each of the teachers indicated that when materials were provided through impersonal means (e.g., mailed) the materials were usually not utilized in their classrooms. Organizations such as Ag in the Classroom who are involved in agricultural literacy efforts are to be applauded for their work. Making follow-up a part of their focus may well strengthen their efforts. In this study, the teachers who had

attended workshops valued the instruction they received, and they also indicated a desire for continued follow-up.

Additionally, local individuals who can serve as educational resource persons should also be identified and made readily available to classroom educators. These individuals may serve to provide additional agricultural information, come into the classroom as a guest speaker, provide a place for field trips, or provide agricultural materials. Desire for more resources, and resource people, were common among the teacher respondents in this study. These efforts need not be monumental, as in the case of one teacher noting her need to have a corn plant to show students.

Teacher respondents were generally unable to recognize means in which agricultural concepts could be taught through academic areas, other than social studies or science units. Instruction, for both current and future teachers, should focus on providing examples of fully integrating agriculture into all areas of the curricula. Materials should be relevant to the entire curriculum. Providing examples of activities in context to academic subject areas will make the agricultural teaching materials more likely to be utilized in the classroom.

In addition to making agricultural literacy resources available to current teachers in ways that maximize their potential use, it is essential to also focus these efforts on the future teacher educators. Efforts should be increased to provide future elementary teachers with the appropriate resources, contacts, teaching materials, and education on integrating agriculture into their classroom. Reaching the future elementary teachers early in their careers will allow them to more easily integrate agricultural material while their curricula are still being

formulated. This effort will need to involve collegiate faculty and the Departments of Education, to bridge the connection between agricultural education and future elementary teachers.

Additionally, efforts should include educational administrators and others involved in developing curricula, to instill in them of the importance of integrating agricultural materials into the curricula. Although this study found that teacher respondents agreed with the importance of including agricultural material, they generally reported a lack of flexibility in curriculum decisions. Those respondents reporting a lack of flexibility were less likely to integrate agricultural materials. Therefore, the effort to increase agricultural materials in the curricula must include more than just the teachers alone.

The state academic standards, approved by the Nebraska State Board of Education, provided a great deal of anxiety for teachers. Teachers were clearly uncertain about how these standards would affect their curriculum and were relying heavily on textbooks until they were more confident of what was expected of them. All future curriculum materials developed should be linked to state standards, to maximize their effectiveness.

Reflecting the teacher respondents more tentative approach to integration and resources, in response to the increased pressure from state standards, the primary recommendation by the teacher respondents in this study was to work with textbook companies to incorporate agricultural information. Terry, Herring, and Larke (1992) made the same recommendation, stating, "agricultural educators should work to improve and expand such textbook units to increase the teaching of agriculture to elementary school

children as opposed to developing separate materials for this purpose" (p. 58). Textbooks for academic subjects are increasingly aligned to state academic standards. Agricultural information must be included in this same manner.

Recommendations for Further Study

The findings of this study are not transferable to different populations of teachers or students, due to its qualitative nature. Additional studies of this nature will give further insight into the current agricultural understanding of students and could be used as a comparison to this and previous studies. These studies help to not only assess the current status of teacher and student agricultural knowledge, but also to evaluate the changing landscape of rural communities.

This study indicated that the 16 selected agriculture concepts do not occupy a predominant place within the curriculum. The positioning of agricultural knowledge at the margins of the elementary curriculum is unlikely to result in strong knowledge gains. While it is not too late to increase the presence of agriculture in the classroom, an important opportunity has passed. Agricultural educators missed the opportunity to take a strong position in the development of academic content standards. As academic standards are re-evaluated, revised, and updated, agricultural educators should position themselves to be an integral part of the process.

At this point, further development should go into linking the *Nebraska Agricultural Education Curriculum Framework and Content Standards* and the *Nebraska L.E.A.R.N.S.* content standards, as well as working to re-evaluate and improve the current *Nebraska Agricultural Education Curriculum Framework and Content Standards*. Without incentives, teachers are unlikely to utilize the *Nebraska Agricultural Education Curriculum Framework and Content Standards* in the classroom.

Teachers involved in the study all indicated a desire to know more about the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). The *Nebraska Agricultural Education Curriculum Framework and Content Standards* serve a useful position within the elementary classroom, but in order to be fully utilized, they must be re-evaluated. Elementary teachers must be involved in the evolution of the *Nebraska Agricultural Education Curriculum Framework and Content Standards.* This will help ensure that the standards are written to the correct level and are easily implemented within the current curriculum. Additionally, this involvement will help to establish "buy-in" from the teachers; if teachers feel a sense of ownership with the materials, they have an increased incentive to utilize them.

Teachers involved in the study were unaware of the *Nebraska Agricultural Education Curriculum Framework and Content Standards.* The *Nebraska Agricultural Education Curriculum Framework and Content Standards* were distributed to high school agricultural education instructors in Nebraska, who were then asked to share the standards with elementary teachers within their school district. Agricultural educators should look for a more effective method of distributing the *Nebraska Agricultural Education Curriculum*

Framework and Content Standards, and evaluate what additional resource materials or training should accompany them.

With the academic standards specified in *Nebraska L.E.A.R.N.S.*, districts are required to submit student assessments to the Nebraska Department of Education for evaluation. There are consequences for school districts in which students do not perform to acceptable levels. There is no such assessment associated with the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999). Linking the *Nebraska Agricultural Education Curriculum Framework and Content Standards* to the current standards which are being evaluated may lead to an increase in the integration of agricultural materials.

Teacher respondents indicated the need for follow-up activities in the current agricultural literacy programs. Additional studies should review effective methods to make follow-up a part of the current agricultural literacy efforts, including the Ag in the Classroom program. Studies should them compare the effectiveness of current agricultural literacy efforts after follow-up measures are implemented.

Finally, further studies should review current textbooks to determine the amount of agricultural information included, along with the accuracy of that information. Teachers in this study indicated a desire to see an increased amount of agricultural information within the textbooks. This is by no means an easy task, as textbooks are rarely produced on a regional basis due to the high cost of developing and publishing a text. Agricultural commodities and practices vary dramatically between different geographic regions and cultures of the United

States, as well as the world. Similarly, agriculture is ever changing, based on technological advances, economic policy, and current events. Studies should look closer at how textbooks are being utilized in the classroom, what role agricultural educators and commodity groups can play in the development of textbooks, and what resources or materials can supplement textbooks. Studies should also determine the effect that increased integration of agricultural information within the textbooks has on student proficiency in agricultural knowledge.

Final Thoughts

Agriculture is too important to not be included in the elementary classroom. Agricultural educators must continue efforts to fully integrate agriculture into the curriculum, while working with elementary teachers, administrators, and teacher educators to ensure that efforts are sufficient to sustain long-term utilization. Full integration requires bridging the gap between a core academic curriculum and the agricultural education curriculum. This is not an effort that involves agricultural educators alone. Although specific objectives and methods differ between teacher and subject areas, both camps have the same general goals in educating students.

In light of a move toward increased evaluation of students based on academic standards, agricultural educators must build any agricultural literacy efforts around this effort and continue to find creative ways to introduce the public to agriculture.

It's often said "students are our future." It's important to further understand that today's students are the consumers and legislative voters of tomorrow. Shouldn't we strive to make sure that students, as future consumers and voters, possess the necessary knowledge surrounding agricultural issues to make well-educated decisions?

APPENDIX A. NEBRASKA AGRICULTURAL EDUCATION CURRICULUM FRAMEWORK AND CONTENT STANDARDS: AGRICULTURAL LITERACY CONCEPTS (NEBRASKA STATE BOARD OF EDUCATION, 1999)

Nebraska Agriculture Concepts:

3–4

- Explain basic process from producer to consumer.
- Fun facts that encompass each of the agriculture sectors.

Crop Production Concepts:

3–4

- Identify local crops grown in Nebraska.
- The importance of water and its origination.
- The effect of climate on crops, both positive and negative.

Agribusiness/Economics Concepts:

3–4

- Identify agricultural businesses.
- Field trip to an agriculture business.

Food Science and Technology Concepts:

3–4

- How does grain become food?
- Is our food safe to eat?
- The food chain.

Conservation/Environmental Concepts:

3–4

- Identify Nebraska threatened and endangered species.
- Importance of planting trees.
- Cause and effects of pollution.

Livestock Production Concepts:

3–4

- Understand the process of meat getting to the dinner table.
- Identify groups of livestock and their names, e.g. litter, herd, flock.
- Nebraska history and rank.

APPENDIX B. ELEMENTARY STUDENT INTERVIEW PROMPTS

Student Name: _____ **Interview Dates:** _____

Hi. Today I'm going to ask you some questions about where food comes from. You will probably have a pretty good idea about some of the things I am going to ask, others you might not. I am interested in finding out what you think about agriculture and how you learned about it. Sometimes I might ask you questions to push you as far as you can go about a certain topic. If you ever don't want to answer a question, just tell me. Do you have any questions?

Research Objective 1: Explore teachers and students' backgrounds and experiences, relative to agricultural literacy knowledge.

1. Can you tell me what grade are you in?
2. Can you tell me about where you live?
3. Where do your parents work?
4. Do you know anyone who lives on a farm?
5. Have you ever been to a farm? Tell me about that trip.
6. Do you have any pets? What kind? Who takes care of your pet?
7. Have you ever helped anyone with a garden? Tell me about it.
8. Can you tell me about a trip to buy food?
9. Do you help cook your food at home? Tell me about something you like to cook at home.
10. Have you ever been to a county or state fair? Can you tell me about that trip? (What did you do at the fair? What did you enjoy most at the fair?)
11. Have you ever learned about plants and animals in school? Can you tell me what you learned about?
12. Are you in 4-H? Tell me about 4-H.
13. Do you talk about agriculture in school?

Research Objective 2: Determine how Nebraska fourth-grade elementary students' understandings of agriculture, or agricultural literacy, compare to goal concepts outlined by the *Nebraska Agricultural Education Curriculum Framework and Content Standards* (Nebraska State Board of Education, 1999).

14. Can you tell me what agriculture is? Where did you learn that?
15. Tell me about farmers.
16. Do farmers go to college?
17. Do you think it is hard to be a farmer? What kinds of things do farmers do?
18. What kinds of technology do farmers use?
19. Can you tell me about some animals that are raised on farms?
20. What are some products that come from animals?
21. What crops do animals eat?
22. 11What is an acre?
23. Can goats produce milk?
24. How often are cows milked?
25. What is wool used for?
26. What is another word for swine?
27. What is leather made from?
28. What is the name for a mother sheep?
29. Can you tell me about some crops (plants) that you might find on a farm?
30. Is there a difference between soils in different areas?
31. What is erosion? How is erosion caused?
32. What crops are grown in Nebraska?

33. What do you need to grow crops? (water, air, sun, fertilizer, soil)

34. What is a pest? How does a farmer keep pests off their crops?

35. What do pesticides do? How do they do it? Are pesticides good or bad?

36. How does the weather effect crops?

37. What part of the plant is a carrot?

38. What part of the plant is wheat?

39. What plant is bread made from?

40. How do you make flour?

41. What does a processing plant do?

42. What animal does hamburger come from? Can you tell me about how they get hamburger from that animal?

43. Can you tell me about how products get from the farm to the store?

44. Do other countries purchase food from Nebraska? What types of food? Does Nebraska purchase food from other countries? What types of food? How does that food get to the different places?

45. Can you name any agricultural businesses?

46. What is pollution? What causes pollution?

47. What is the name for a mother chicken?

48. What is the name of a male chicken?

49. Where does hamburger come from? Can you tell me how that happens?

APPENDIX C. ELEMENTARY TEACHER INTERVIEW PROMPTS

Teacher Name: _____ **Interview Dates:** _____

Research Objective 1: Explore teachers and students' backgrounds and experiences, relative to agricultural literacy knowledge.

1. How many years have you been teaching?
2. Describe the area where you currently live.
3. Describe the area where you grew up as a child.
4. Tell me about your experiences with agriculture.

Research Objective 3: Determine extent of integration of agricultural concepts into the academic curriculum.

5. Can you describe agriculture? How would you define agriculture?
6. Do you teach any agriculture-related material in your classroom? (Teachers may need examples given – gardening, small animal, nature, environment, business, etc.) Explain what those lessons are like.
7. Do you have any lessons that deal with animals, plants, or food and fiber processing? Explain these lessons to me.
8. If yes, where do you teach this information (math, science, history, etc.)? Describe the setting in which those lessons take place.
9. If no, why do you not teach it? Would you teach it with help?
10. Are you familiar with the Nebraska Agricultural Literacy Concepts? If so, how have you used the concepts?

11. Looking at these concepts, do you think your students know this information?
12. Are these concepts appropriate to your students? Is it feasible for you to teach it?
13. How would you change the concepts?
14. Would you use these concepts?
15. Are they written in a way that is easy for you to understand?
16. Do you feel it is important that students know these concepts?
17. Would you feel comfortable teaching this material?
18. What could be done to increase your comfort level with teaching this material?
19. Have you ever heard of "Ag in the Classroom" or "Food for America"?
20. Is so, what have your experiences been?
21. How did you find out about their material? How have you used the material?
22. Is it important for agricultural lessons to be linked to State Standards?
23. Do you have difficulties finding materials for your integrated lessons?
24. Where do you find these materials?
25. Do you have speakers come into your classroom? How do you find your speakers?
26. Would you like to have a listing of available resources, materials, or guest speakers?
27. If there were a facility, within 30 miles, available for field trips that would teach agricultural literacy, would you use it? What would you like to see included?
28. Are there any district standards that you teach from?
29. What do you feel are the barriers limiting elementary teachers from integrating agriculture?

APPENDIX D. REFLECTION STATEMENT

Please take a few moments to go through the following questions. These are designed to help you reflect on your experiences with agriculture – similar to journaling on a small scale.

1. How would you define agriculture?

2. What are some of your experiences with agriculture?

3. Do you teach any agriculture-related material in your classroom?

4. What is your confidence and/or willingness in teaching agriculture?

APPENDIX E. PARENT CONSENT LETTER

Date

Dear parent/guardian:

I am a student in the Department of Agricultural Education and Studies at Iowa State University. I am conducting a research project on student perceptions and understandings of agriculture. This is a personal interest of mine, since I have taught students about the importance of food and food production's effects on the environment, as a former high school agricultural education instructor. My research will involve elementary school students and their teachers. I plan to determine elementary student understandings concerning agriculture and their teacher's views of what agricultural knowledge is appropriate.

Through this research, I hope to inform people about the absence of agricultural education in our public schools. To conduct this research, I will interview elementary students and their teacher. There will be two to three interview sessions, each of which will not take more than 25 minutes. The interviews will be audio taped so that I can refer back to them at a later date. The interviews will take place at the school, during the school day. The specific time of the interviews will be decided by the classroom instructor, to not disturb the children's school schedule.

All responses will be kept in strict confidence. Participants' request to stop the interview or to stop the audio recording will be honored immediately upon request. All names will be changed, of both the student and school, in any published documents. All personal or identifying information will be deleted or changed, to protect the students' privacy.

Since my work involves minor children, I need to obtain permission from their guardian for the interview. If you will allow your child to participate, please fill out the attached form. Participation in this research study is voluntary.

Thank you for considering allowing me to interview your child for this study. If you have any further questions, please contact me.

Sincerely,

Stacie Turnbull
Iowa State University
Graduate Student
sturnbul@iastate.edu
(515) 233-4349 W

APPENDIX F. ELEMENTARY STUDENT RELEASE FORM

I, _____, agree to participate in the research study described in the attached letter. The study has been explained to me and I have been informed of the potential benefits and possible risks of participation.
I further understand that a pseudonym will replace my real name in any report of the research findings and that any identifying information about me will be deleted or protected with pseudonyms. My identity may be known to the principal investigator but will be kept confidential. I may refuse to answer any questions or to stop the interview at any time. I may ask for the audio tape recorder to be turned off at any time during the interview.

My child has permission to participate in the research study described in the attached letter.

==========

_____Guardian Name
(please print)

_____Signature

_____Date _____Phone

==========

I, _____, would prefer not to participate.

_____Participant's Name
(please print)

_____Signature

_____Date _____Phone

APPENDIX G. INSTRUCTOR CONSENT LETTER

Date

Dear instructor:

I am a student in the Department of Agricultural Education and Studies at Iowa State University. I am conducting a research project on student perceptions and understandings of agriculture. This is a personal interest of mine, since I have taught students about the importance of food and food production's effects on the environment, as a former high school agricultural education teacher. My research will involve elementary school students and their teachers. I plan to determine elementary student understandings concerning agriculture and the teacher's view of what agricultural knowledge is appropriate.

To conduct this research, I will interview one elementary student and their teacher, from eight schools across Dodge County. There will be two to three interview sessions, each of which will not take more than 25 minutes. The interviews will be audio taped so that I can refer back to them at a later date. The student interview will take place at the school, during the school day. Teacher interviews will take place at the school, at the your convenience. The specific time of the student interviews will be decided by you, as to not disturb the children's school schedule.

All responses will be kept in strict confidence. Participants' request to stop the interview or to stop the audio recording will be honored immediately upon request. All names will be changed, of both the student and school, in any published documents. All personal or identifying information will be deleted or changed, to protect the school, student, and teacher's privacy.

I need to obtain your permission for the interview. I will also be obtaining permission from the teachers, students, and the students' parents. If you will agree to your participation in the study, please fill out the attached form. Participation in this research study is voluntary.

Thank you for considering allowing me to interview you for this study. If you have any further questions, please contact me.

Sincerely,

Stacie Turnbull
Iowa State University
Graduate Student
sturnbul@iastate.edu
(515) 233-4349 W

APPENDIX H. INSTRUCTOR RELEASE FORM

I, _____, agree to participate in the research study described in the attached letter. The study has been explained to me and I have been informed of the potential benefits and possible risks of participation.

I further understand that a pseudonym will replace my real name in any report of the research findings and that any identifying information about me will be deleted or protected with pseudonyms. My identity may be known to the principal investigator but will be kept confidential. I may refuse to answer any questions or to stop the interview at any time. I may ask for the audio tape recorder to be turned off at any time during the interview.

==========

_____ Teacher Name
(Please print)

_____Signature

_____Date _____Phone

==========

I, _____, would prefer not to participate.

_____ Teacher Name
(Please print)

_____Signature

_____Date _____Phone

APPENDIX I. ADMINISTRATOR CONSENT LETTER

April 22, 2002

Dear School Administrator:

I am a student in the Department of Agricultural Education and Studies at Iowa State University. I am conducting a research project on student perceptions and understandings of agriculture. This is a personal interest of mine, since I have taught students about the importance of food and food production's effects on the environment, as a former high school agricultural education teacher. My research will involve elementary school students and their teachers. I plan to determine elementary student understandings concerning agriculture and the teacher's view of what agricultural knowledge is appropriate.

To conduct this research, I will interview one elementary student and their teacher, from eight schools across ESU #2. There will be two to three interview sessions; teacher interviews will take approximately 45 minutes, while student interviews will take not more than 25 minutes. The interviews will be audio taped so that I can refer back to them at a later date. The student interview will take place at the school, during the school day. Teacher interviews will take place at the school, at the teacher's convenience. The specific time of the student interviews will be decided by the classroom instructor, to not disturb the children's school schedule. The student will be paid $5 for their participation.

All responses will be kept in strict confidence. Participants' request to stop the interview or to stop the audio recording will be honored immediately upon request. All names will be changed, of both the student and school, in any published documents. All personal or identifying information will be deleted or changed, to protect the school, student, and teacher's privacy.

I need to obtain your permission for the interview. I will also be obtaining permission from the teachers, students, and the students' parents. If you will agree to your participation in the study, please fill out the attached form. Participation in this research study is voluntary.

Thank you for considering allowing me to interview you for this study. If you have any further questions, please contact me.

Sincerely,

Stacie Turnbull
Iowa State University
Graduate Student
sturnbul@iastate.edu
(515) 233-4349 W

APPENDIX J. ELEMENTARY INSTRUCTOR RELEASE FORM

I, _____, agree to participate in the research study described in the attached letter. The study has been explained to me and I have been informed of the potential benefits and possible risks of participation.

I further understand that a pseudonym will replace my real name in any report of the research findings and that any identifying information about me will be deleted or protected with pseudonyms. My identity may be known to the principal investigator but will be kept confidential. I may refuse to answer any questions or to stop the interview at any time. I may ask for the audio tape recorder to be turned off at any time during the interview.

==========

_____Superintendent/Principal Name
(Please print)

_____Signature

_____Date _____Phone

==========

I, _____, would prefer not to participate.

_____Superintendent/Principal Name
(Please print)

_____Signature

_____Date _____Phone

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